# The Chemical Age

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# Notes and Comments

## The British Association

FOUNDED at York in 1831, the British Association for the Advancement of Science assembled for the fifth time in that ancient city for its 101st. annual meeting on Wednesday, and will continue its deliberations there until September 7. Its members have taken a delight in returning to a birthplace of happy memory and in recalling hopes which the past hundred years have generously fulfilled. Last year the infant of 1931 celebrated its centenary in the vigour of manhood, with a plenitude of pomp and circumstance which demanded no less ample a setting than the Metropolis of the Empire, and now it is revisiting its birthplace well aware of its maturity. Its president this year is Sir Alfred Ewing, whose presidential address on Wednesday evening was a worthy contribution to the high traditions of the Association.

Sir Alfred Ewing viewed the future of scientific discovery from an engineer's point of view, and discussed the change in the attitude of the scientists from one of "cocksureness" to a frank admission that they are groping in a half-light, "tentatively grasping what at best are only half truth." He pointed out that the new spirit strengthens a sense of brotherhood between the specialist and the layman, while the advance of science makes an increasing claim on the layman's notice through its technical applications. Thus the British Association keeps its hold on the public because it links experts with one another and with the laymen, to the benefit of all. Sir Alfred recalled the lack of scientific knowledge on the part of early British engineers, and pointed to the need in those days for the "scientific leaven" which the British Association provided in this branch of science. At the date of the foundation of the Association more than fifty years had passed since the invention of Watt provided an engine fit to serve as a general means of providing power. But neither the engineers nor the physicists of that period had any notion that the process involved the conversion of heat into mechanical work.

## The Future of Science

TURNING to electricity, Sir Alfred Ewing described the "whole art of electrical communication" as an unqualified blessing, "which even the folly of nations cannot pervert." He pointed out that before it came into use the sections of civilised man were far more separated than they will ever be again. He asked whether it was possible to imagine any practical gift of science more indispensable as a step towards establishing the sense of international brotherhood which we now consciously lack and wistfully desire.

Sir Alfred suggested a changed spirit in the present-day thinkers' attitude towards mechanical progress. Admiration is tempered by criticism; complacency has given way to doubt; doubt is passing into alarm. He suggested that there is a sense of perplexity and frustration, as in one who has gone a long way and finds he has taken the wrong turning. To go back is impossible. How, Sir Alfred asked, is he to proceed? Where will he find himself if he follows this path or that? The president described himself as "an old exponent of applied mechanics" as he expressed something of the delusion with which, now standing aside, he watches the sweeping pageant of discovery and invention in which he used to take unbounded delight. It is impossible, he said, not to ask, whither does this tremendous procession tend? What, after all, is its goal? What is its probable influence upon the future of the human race?

He described the "pageant" itself as a modern affair. A century ago it had barely taken form and had acquired none of the momentum which rather awes us to-day. What Sir Alfred described as the cornucopia of the engineer" has been shaken over all the earth, scattering everywhere an endowment of previously unpossessed and unimagined capacities and powers. The president admitted that beyond question many of these gifts are benefits to man, making life fuller, wider, healthier and richer in comfort and interest. But he pointed to the danger that the engineer's gifts may be grievously abused. The command of nature has been put into man's hands before he knows how to command himself. The president concluded by discussing the effect of mechanical production on human effort. He suggested that there is a sinister side even to the peaceful activities of those who in good faith make it their business to adapt the resources of nature to the use and convenience of man.

## Efficiency in Solvent Recovery

IN view of the fact that 3 kilos of acetone are volatilised in the course of production of each kilo of cellulose acetate rayon, the economic necessity for recovering this solvent is self evident. At present four main types of acetone recovery processes are available. There is solution in water; solution in cresol, or a 3.4 mixture of meta-cresol and tretralin (Brégéat process); adsorption by active carbon; and adsorption by silica gel. In a recent issue of "Metallbörse" (August 3, page 991), it is pointed out that certain disadvantages are peculiar to each of these processes. Dissolution in water is lengthy and none too efficient, giving a recovery yield of 80 per cent., and necessitating an installation on a very large scale, against which must be set off the cheapness of the absorbent medium. The

drawbacks of the Brégéat process—in spite of a 90 to 96 per cent. acetone recovery—are the corrosive nature of the absorbent agent and the loss of 1 kilo of cresol for each 10 to 12 kilos of recovered solvent. The excessive heat developing in the course of acetone adsorption by active carbon may result in a conflagration unless the precaution is taken of working in an inert atmosphere. Silica gel absorbs atmospheric water vapour in addition to solvent, while the hot steam subsequently required to drive off the acetone from the gel results in partial decomposition of the solvent.

With the "acticarbon" process introduced by the Société de Recherches et d'Exploitations Pétrolifères of Paris, even vanishingly small concentrations of acetone vapour, as low as 1 gram per cubic metre, are recoverable with an average yield of 96-97 per cent. After driving off the adsorbed solvent with water vapour, the charcoal is again available for use, but it should be noted that in common with other carbon adsorbents, this material is poisoned by sulphur compounds, coal tar bodies and dust.

## Energy Problems in Large Scale Industry

NEXT year's sectional meeting of the World Power Conference in Scandinavia, preliminary details of which appeared in THE CHEMICAL AGE on May 7 (page 420) will deal with the energy problems of large scale industry and of transport, six sections being devoted to industry and three to transport. Special interest from the chemical point of view will be centred in the sections which will discuss power and heat combinations and the special energy problems of some of the steam heat consuming industries. The crux of the problem of power and heat combinations is how, in combined generation of power and heat, the best use can be made of the high theoretical efficiency of this method of generating energy, at the same time satisfying the multitude of practical requirements of modern industry in respect of low installation and maintenance costs, high reliability and flexibility of operation with regard to the quantity of heat and power available, temperature levels, regulation etc. A host of questions arise through the circumstance—generally found in practice—that, on the one hand, the momentary rate of the *heat* requirements is independent of, and varies in quite a different way from, the momentary value of the *power* requirements in the same industrial plant (or group of plants), and, on the other hand, that, on the whole, is the combined generation of power and heat the two kinds of energy have to be generated simultaneously and at mutually dependent rates. The possibility and economy of reducing or completely obviating this interdependance, *e.g.*, by storage of one or both kinds of energy or by co-operation with other sources of power or heat, are of great importance in this connection.

## Limited Sources of Energy

PARTICULARLY interesting solutions are called for when the quantities of energy available from the additional sources, with which co-operation is established, are limited, and dependent on time, as is for instance the case with water power, or so-called waste power (*e.g.*, that generated by combustible or hot furnace gases in iron or steel works). Major problems which determine the part to be played by combined generation of heat and power in the whole scheme of national or international energy supply include the position of individual power and heat stations in relation to one another and to the general distribution networks with which they co-operate. The possibilities of equalisation and improved availability and standby capacity offered by co-operation between several power and heat stations, and the technical and economic limits to the activities of such independent undertakings as aim at simultaneous distribution of heat and power (by means of gas, steam, hot water, or electric current) are also of great importance.

Among the detailed problems to be discussed are the following: The utilisation of local fuels, the seasonal variations in power and heat requirements and their influence on co-operation between works. The maintenance of reliability of operation and the limitation of the effects of disturbances, distribution and control of the heating and power loads, methods of metering, and debiting of costs, economical planning of pipe systems with regard to installation and maintenance costs and losses of heat and pressure, and the choice of process steam pressures (temperatures) in the light of the technology of modern heat consuming apparatus, direct cooking versus indirect cooking, return of condensates, pressure control, etc.

## Steam Heat Consuming Industries

WHILST a number of problems in the pulp and paper industries will be taken as examples in the section of the World Power Conference dealing with the special requirements of the steam heat consuming industries, it has been pointed out in a preliminary note on the work of the section that similar conditions are encountered in nearly every industry employing steam. Pulp digesting now is often carried out by means of a circulating fluid. The boiling system used affects the amount of steam power obtainable, since steam quantity and pressure depend on the digesting system. Evaporation plays an important part in the sulphate industry, being a prominent factor in soda-house work, which in this case should be studied in its entirety. Drying is usually done on cylinder drying-machines; here several problems arise concerning, for instance, the temperature distribution along the machine, the effect of the air inside and immediately outside the machine, the ventilation, the removal of air and water from the drying cylinders, the method of enclosing the whole machine in an air-tight casing and preserving in this a vacuum, or atmospheric or excess pressure. The devices for utilising the heat in the condensate and secondary steam are of interest. The recently introduced methods of drying cellulose by air in drying chambers must receive attention.

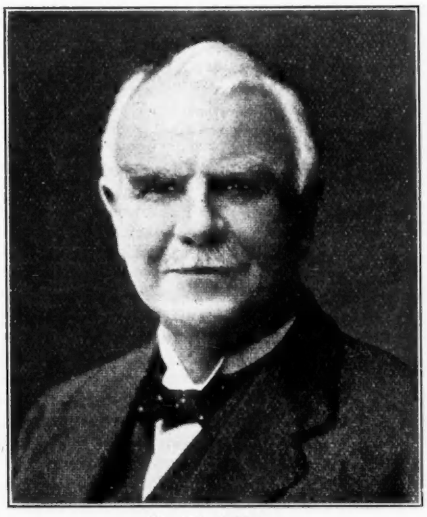
Ventilation in this manufacturing process is often intimately connected with the utilisation of heat from condensate and secondary steam. General problems connected with the economic aspects of heating are abundant. The use of wood waste from manufacturing processes often involves the previous removal of water by pressing or drying. Its burning in furnaces constructed for the simultaneous combustion of coal gives rise to problems of frequently far-reaching importance. In this connection the utilisation of black liquor from the sulphate process takes a special place.

# The British Association Meeting at York

## Sir Alfred Ewing's Presidential Address

THE British Association for the Advancement of Science, which was founded at York in 1831 and held its centenary celebrations in London last year, appropriately returned to York for the opening of its second century. The 101st annual meeting opened on Wednesday evening, with Sir Alfred Ewing's presidential address, and the sectional meetings of the Association will continue daily until September 7.

Sir Alfred Ewing, in the course of his presidential address, said a notable event of the year was the strong evidence which Dr. Chadwick, of the Cavendish Laboratory, had found for the existence of the neutron—a type of particle in which an electron and a proton are associated in particularly close juxtaposition. There is a like close association between electrons and protons in the nucleus of any heavy element, he said, but it had not previously been discovered in a single isolated pair. Twelve years ago Lord Rutherford conjectured the existence of such a particle and described the properties it should possess. Its excessive smallness and density, together with its lack of an external electric field, give it a unique power of penetrating matter. It is too slim to be confined under pressure in any vessels. It will simply slip through the walls. The normal hydrogen atom has the same two constituents, one proton and one electron, but in nothing like the same intimacy of association, for the hydrogen atom wears its electron as a bulky crinoline which confers on it an immensely greater volume. The neutron, on the other hand, may be said to have taken the crinoline off, folded it up and put it in its pocket. Not to be too fanciful, we may at least describe the partners as clasping one another so tightly that the electron has ceased to be a fender; none the less as a unit of negative electricity it still serves to give electrical balance to the pair. Though so close together the two constituents of the neutron remain separate and distinct, parted by nearly as many million volts as in a hydrogen atom. In this hitherto unknown particle, whose existence the experiments of Dr. Chadwick seem to have definitely proved, we have a new physical entity of extraordinary interest and a powerful tool for further research.



Sir Alfred Ewing.

Lord Rutherford was the first to discover and name the nucleus. It is the inner sanctuary of the atom, the repository of secrets, many of which have yet to be disclosed, almost unapproachable, not only because of its smallness but because of the electric field in which it is encased. Recognising the nucleus to be a richly charged strong-room, Rutherford has spared no effort to break it open. He has submitted it to a furious bombardment, using as missiles the alpha particles which radioactive substances project.

These particles, each consisting of four protons and two electrons compactly built together, have the necessary velocity and energy to penetrate to the atom's heart. Rutherford had perforce to fire into the brown. He could not aim his gun, nor even tell when it would go off: the chances of a hit were no more than one in many millions. But hits were in fact obtained—hits so effective that they chipped off protons and caused the missile to be absorbed, thus realising the dream of the alchemist by making one element change into another. That was a dozen more years ago. Since then his attack has lost none of its severity. It has been taken up under his guidance by a school of workers and many further secrets of the nucleus have been revealed.

Quite recently two of his disciples have gone one better, as disciples sometimes do, to the joy of their lords. Dr. Cockcroft and Dr. Walton have used missiles of their own making instead of those that come spontaneously and intermittently from substances such as radium or thorium. By beautiful devices they have applied their knowledge of electrical engineering and their mastery of electrical technique to project single protons into the nucleus of lithium, using a steady potential of several hundred thousand volts to give the projectile sufficient penetrating power. An atom of lithium has (usually) seven protons and four electrons in its nucleus; the other three electrons constitute the crinoline. Here again it was a case of firing into the brown: out of millions of shots a few reached their billet. When the projected proton forces an entry into the lithium nucleus it creates a domestic disturbance of the liveliest kind. For with the seven protons already in occupation it makes an eighth; the group then splits into two sets of four, each taking two of the electrons, and they fly violently apart with an energy drawn from the atomic magazine. The result is that two helium atoms are formed. This is a notable achievement, the first artificial splitting of the atom by a laboratory process in which there is no recourse to the violent projectiles which radioactive substances provide. It has been followed up by successfully applying the same method to break up the atoms of other elements.

It is a satisfaction to learn that in all the encounters and emissions and absorptions that are studied among atoms and photons and the parts of atoms there is, so far as we yet know, strict compliance with the accepted principles of conservation in respect of momentum and energy and mass, though matter (in the ordinary sense) is liable to transformation into energy and energy into matter. When radiation is emitted some matter disappears, for the atom that emits it loses a little of its mass; when radiation is absorbed a like quantity of matter comes into being.

But the engineer finds himself obliged to admit that no mechanical model of the atom can be expected to give an adequate picture of that strange new world. Our mechanical ideas are derived from the study of gross matter, which is made up of aggregates of atoms, and any model must share the limitations this implies. It is futile to explain the constitution of the atom in terms applicable to gross matter, just as it would be futile to study the psychology of an individual by observing only the movements of crowds. So we fust expect to find within the atom and among its parts qualities and actions different in kind from those we know, and paradoxes which without a wider vision we cannot interpret. Such a paradox indeed confronts us at the present time, when we try to harmonise the wave aspect and the particle aspect of the photon, of the electron, and indeed of matter itself. Thse things are still a mystery—a riddle which some day we may learn to read. Meanwhile we do well to remember that any attempt to portray the structure of the atom in the language of ordinary experience is to give undue significance to symbols and analogies that are more or less invalid.

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THE Societa Elettrica ed Elettrochimica del Caffaro of Brescia reports that its basic copper chloride for use as a fungicide has met with great success, and that a portion of the output is being exported to the Balkan countries and South America. The material is produced in stable powdered form. A French firm (Alais, Froges et Camargue) has acquired a licence for the use of the patent rights for production of this material in France.

# Some Aspects of Stereochemistry

By Dr. W. H. MILLS, F.R.S.

Dr. W. H. Mills is this year's president of the Chemistry Section of the British Association, which is holding its meeting at York. The following extracts are taken from his presidential address, delivered on Thursday, September 1.

LOOKING back on the history of stereochemistry we can distinguish a succession of well-marked phases in its development. There was the initial phase, Pasteur's discovery of *lævo* tartaric acid, his consequent recognition that every optically active substance must have its antipode, and his establishment of the doctrine of molecular dissymmetry. The theory of van't Hoff and Le Bel of the relation between molecular dissymmetry and structure in carbon compounds marked the beginning of a second phase. It originated soon after the structure theory had developed sufficiently to provide an adequate basis for it. In the form in which it was presented by van't Hoff—the theory of the tetrahedral distribution of the valencies of the carbon atom—it provided a framework into which we have been able to fit practically all that we know of the stereochemistry of carbon.

## Mirror-Image Isomerism

A new stage was marked by Pope's discovery that the valencies of other elements besides carbon had sufficient configurational stability to give rise to mirror-image isomerism, and a further advance was attained when Werner brought within the scope of stereochemical investigation those complex compounds of the transitional elements which at that time seemed to lie outside the domain of the ordinary laws of valency. By the optical resolution of compounds of this class he established the theory of co-ordination and at the same time demonstrated the association of the co-ordination number 6 with octahedral configuration. The rule of the asymmetric carbon atom has provided so simple and reliable a guide to indicate when molecular dissymmetry was to be expected in carbon compounds, and the number of stereomers corresponding with a given molecular structure dould be so simply determined with its aid that a certain tendency had arisen among organic chemists to think too much in terms of asymmetric atoms and lose sight of the more fundamental principles on which the conception was based. A stage of some importance in the development of stereochemistry was therefore marked by the synthesis, by Perkin and Pope, and the subsequent resolution of methyl*cyclo*hexylideacetic acid.

The present period is one that has been marked by particularly notable advances. On the other hand, progress in molecular physics and in crystallography has given us a knowledge of atomic dimensions and of the configuration of simple molecules and ions which, as far as he can see, could never have been obtained by the methods of classical stereochemistry. It is the progress thus attained which chiefly distinguishes the present period from those that have gone before. We have only to recall the discovery of molecular dissymmetry in the diphenyl series dependent on the restriction of rotation about a single bond, the discovery of optically active sulphinic esters and sulphoxides, and of optically active salts of nitroparaffins, the determination of the true configuration of aldoximes and ketoximes and the demonstration of the non-planar strainless character of six- and higher-membered alicyclic rings to see how far from being exhausted is the usefulness of the methods of classical stereochemistry.

## New Knowledge of Atomic structure

The electronic theory of valency, which was one of the first-fruits of the application of the new knowledge of atomic structure to chemical problems, has greatly increased the clearness of our ideas of the various types of chemical combination, and the octet rule in particular has enabled us to gain a fuller understanding of the constitution of many atomic groupings. The octet theory has not only led to a greatly increased clearness in our views of the nature of valency. We have only to supplement it by a simple three-dimensional interpretation and it serves also to indicate the relative directions of the valencies in space. If we consider the general results of the stereochemical investigation of compounds in which we have to infer that a central atom is associated with an octet of electrons corresponding with the electron group of highest principal quantum number in the succeeding inert gas, we find it clearly indicated that there is something in the arrangement of this octet which is related to a tetrahedral configuration. If this octet really does correspond with that of the inert gas, it is what we might expect if the orbits of the electrons constituting the inert gas octet might in certain circumstances be related to a tetrahedral system of axes. The tridimensional extension of the octet theory can be simply represented, of course, in a purely diagrammatic manner, by placing the four pairs of dots by which the four pairs of electrons of the octet are indicated, at the four angles of a tetrahedron concentric with the atom under consideration. There is little doubt that atoms are deformable, and we have clear evidence that valencies can be deflected. We can therefore only expect the tetrahedron to be a regular tetrahedron when the central atom is linked to four other atoms and these are all alike. The tetrahedral octet will therefore only indicate the general character of the configuration of the compounds represented with its aid; it cannot be expected to predict accurate values of inter-valency angles. Where in such compounds we have to infer the presence of two electron links only, then we find invariably that a four-co-ordinate atom has a tetrahedral configuration, a three-co-ordinate atom a pyramidal, and a two-co-ordinate atom an angular configuration. This is illustrated by the configurations of methane, ammonia and water.

## Molecular Dissymmetry

The general value of the stereochemical indications given by the octet rule is well illustrated by a comparison of some of the compounds of sulphur with compounds to which, until comparatively recently, chemists were in the habit of attributing similar constitutions. Thus, application of the rule shows at once that sulphur dioxide will not correspond in configuration with carbon dioxide. In sulphur dioxide one oxygen atom, according to the octet rule, must be bound by a four-electron link, the other by a two electron link to the sulphur. The tridimensional octet indicates that sulphur dioxide must then have an angular configuration with an angle between the lines joining the sulphur and the oxygen centres which, if the tetrahedron were regular, would be 125.5°; and, as is well known, the large molecular di-pole moment and the indications of the infra-red spectrum of sulphur dioxide show that its configuration must be angular.

I believe the highly interesting discovery by Phillips, some seven or eight years ago, of the molecular dissymmetry of the sulphinic esters came as a complete surprise to chemists, for the common practice had been to assign to these compounds a constitution analogous to that attributed to the carboxylic esters. In a similar way the sulphoxides were generally given formulæ corresponding with those of the ketones until Kenyon and Phillips showed that sulphoxides of appropriate constitution could be resolved into optical antimers. Had the confidence then existed in the octet theory and its stereochemical implication that we have since acquired, the pyramidal configuration of the three-co-ordinate sulphur in these compounds could have been most easily predicted.

One of the most striking features of the stereochemistry of the pyramidal tri-co-valent atoms is the great variation in configurational stability exhibited by compounds of the different atoms. We may contrast, for example, the permanence of the optical activity of dissymmetric sulphonium ions with the configurational ability of the tertiary amines, which has hitherto prevented the demonstration of the pyramidal configuration by the methods of classical stereochemistry, though it is clearly shown by the considerable molecular di-pole moments which they possess. It is clear that increase in the atomic radius of the central atom should diminish configurational stability. It is probably in consequence of this that it is so much easier to obtain quaternary ammonium ions i nan optically active state than the corresponding phosphonium and arsonium compresses. Again,

we should expect that compounds in which the normal valency only of the central atom is employed would show greater configurational stability than co-ordination compounds, for the reason that in the latter the nuclear charge of the central atom is relatively less in comparison with the number of electrons it has to control.

### The Optical Activity of Living Matter

I now pass to the consideration of a question which has been of deep interest to all who have reflected on stereochemical problems, the optical activity of living matter. It was a subject to which Pasteur devoted much thought, and he was disposed to seek the origin of the optical activity of the products of vegetable life in cosmic causes. "The universe," he said, "is a dissymmetrical whole. I am inclined to think that life, as manifested to us, must be a function of the dissymmetry of the universe or of the consequences that result from it. The universe is dissymmetrical; for, if the solar system were placed before a mirror, the image of the bodies that compose it moving with their several motions could not be superposed on the reality. Even the movement of solar light is dissymmetrical. A luminous ray never falls without constant change of direction on the leaf in which vegetable life is bringing about the creation of organic matter. Terrestrial magnetism, the opposition which exists between the north and south poles in a magnet, that offered us by the two electricities positive and negative, are but resultants from dissymmetrical actions and movements."

Pasteur tried to obtain experimental confirmation of these views. At Strasburg he had powerful magnets constructed with the object of introducing dissymmetric influences during the formation of crystals. At Lille again, in 1854, he had a clockwork arrangement made by means of which he intended, with the aid of a heliostat and reflector, to cause a plant to germinate and grow under conditions in which the natural apparent movement of the sun from east to west was reversed.

Since the discovery by Cotton in 1896 that alkaline solutions of copper tartrate have unequal coefficients of absorption for dextro- and lævo-circularly polarised light, the action of circularly polarised light appeared to be the most promising method of obtaining molecularly dissymetric compounds in an optically active state without the use of other optically active substances. Since, further, circularly polarised light must occur in nature—as, for example, by reflexion of the plane polarised part of the light of the sky at the surface of the sea—the unequal destruction which it must effect of the dextro- and lævo-forms of dissymmetric compounds acting for immense periods of time, has been regarded by some as the most probable cause of the optical activity of the compounds contained in living matter, especially as Byk has shown that, in consequence of the rotation of the plane of polarisation of the light by the earth's magnetism, there must be a preponderance of one of the two forms in the total amount of circularly polarised light thus produced. These considerations have been brought into prominence by the marked success which has recently been attained by Werner Kuhn and Knopf in activating the dimethylamide of a -azidopropionic acid by means of circularly polarised light.

### Activating Effect of Polarised Light

When one considers, however, the minuteness of the proportion of the total illumination received by an organism under natural conditions that can be circularly polarised, and the difficulty that has been experienced in demonstrating the optically activating effect of this form of light, even under the favourable conditions of the laboratory, it is impossible not to feel a certain scepticism of an explanation based on the action of circularly polarised light thus produced. It is true that circularly polarised light of greater intensity might be produced by naturally occurring doubly-refracting minerals, but its production in this manner would be necessarily so highly localised and so evenly distributed between the dextro- and lævo-forms that it is difficult to believe that initially optically inactvee living matter could be rendered optically active through the agency of circularly polarised light produced in this way. It would, therefore, seem not out of place to seek for other possible causes of the dissymmetry of living matter, and it may be profitable to inquire whether the property of growth which is characteristic of living matter may not necessarily lead to its dissymmetry.

We know that many components of living matter are substances of great molecular complexity, and the more complex the substance the more likely it is to be molecularly dissymmetric, and, as a matter of fact, a large proportion of the compounds which occur in living organisms are optically active. Again, many of the reactions which go on in living matter, and on which vital activity depends, are thus reactions between molecularly dissymmetric compounds. Now when a reaction takes place between two molecularly dissymmetric compounds, there is always more or less difference between the velocities of reaction of a given antimer of the one compound with the two antimeric forms of the other. Thus. as was shown by Marckwald and McKenzie, lævo-menthol reacts more rapidly with dextro-mandelic acid than it does with lævo-mandelic acid. It is easy to see why this should be. Chemical interaction between organic compounds necessitates the apposition of the two reacting groups in a particular manner, and when each of the reacting groups possesses a complex environment it is evident that there must be a difference in the readiness with which a dissymmetric molecule can be thus opposed to the dextro- and lævo-forms of a co-reactant molecule.

It is probable that many of the reactions on which vital processes depend are highly stereo-specific. Of isolated reactions that can be studied *in vitro*, it would seem that those most nearly related to the reactions of living matter are reactions involving enzymes, and it is well known how highly stereo-specific these may be. In living matter, every dissymmetric component is present in one only of its two antimeric configurations, and it appears that the configurations of these components are so correlated that each dissymmetric molecule encounters only that antimer of its dissymmetric co-reactants with which it interacts the more rapidly. It is evident, therefore, that living matter thus constituted must be greatly more efficient than a hypothetical form of living matter in which every dissymmetric component was present in equal quantities of both its antimeric forms.

### A Simplified Biological Process

This can perhaps be made clearer by consideration of some reaction which we might regard as a simplified model of a biological process. Let us consider the hydrolysis of dextro-sucrose by invertase, at not too great concentrations, so that the velocity of hydrolysis is approximately proportional to the concentrations both of substrate and of enzyme, and compare the initial rate of inversion with what it would be if we employed instead inactive materials at the same total concentrations—*dl*-sucrose and inactive invertase. From the known specificity of the action of invertase we may safely assume that ordinary invertase would activate dextro-sucrose only and that its mirror image would activate lævo-sucrose only. Then it is clear that in the first experiment every sucrose molecule that encountered invertase would be susceptible of activation by it, whereas in the second only half the encounters would be potentially effective and the reaction would proceed at only half the rate at which it takes place in the optically active mixture.

Let us now consider the optical activity of living matter in connection with the phenomenon of growth. In the growth of, for example, a vegetable organism of a primitive undifferentiated type we observe the existing tissue building up, with the aid of absorbed radiant energy, tissue of the same nature as itself from the materials of its inorganic environment. We have an association of chemical compounds which is capable of synthesising from simple inorganic materials each of the organic materials of which it is itself composed, and the rates of production of these are controlled, so that each is produced at a rate which, on the average, is proportional to the amount of it present in the tissue. We have particularly to note that, though the new tissue is built up from symmetrical inorganic materials, each of its dissymmetric components is produced in one only of its two optically active forms, and this form is the same as that present in the tissue by which it has been produced. We must therefore conclude that the chemical reactions concerned in growth, or at any rate those concerned in the production of the primary dissymmetric tissue components, are completely stereo-specific.

Let us now endeavour to imagine what the effect on the process of growth would be if all the dissymmetric components of the growing tissue were instantaneously racemised. On account of the stereo-specific character of the mechanisms of growth we should then have two practically independent mechanisms working side by side. We should have the original mechanism producing dissymmetric compounds of the configurations which occur in nature, *d*-glucose, *d*-cellulose, *d*-tartaric acid, *l*-leucine, and so on. We may arbitrarily call this the *d*-system. The concentrations of all its dissymetric components would be reduced by this racemisation to half their original values. Working alongside this, and in practical independence, we should have the enantiomorphous *l*-system producing antimers of the dissymmetric compounds found in nature.

The velocities of the different synthetic processes would be variously affected by this change. The velocity of the fundamental process of carbohydrate photosynthesis, the formation of the symmetrical compound formaldehyde from symmetrical carbon dioxide and water, would remain unchanged. This process is independent of mirror-image isomerism; there is thus no need for assimilation pigments to be optically active, and chlorophyll is in fact described as being optically inactive. Again the condensation of formaldehyde to glucose, in which a dissymetric polymerisation-catalyst must necessarily be involved, since normally the *d*-form of glucose is alone produced, would take place initially with unaltered velocity on account of the symmetry of formaldehyde. Immediately after the change the inactive tissue would go on producing *dl*-glucose at the same rate at which the optically active issue had been producing *d*-glucose.

As soon, however, as we come to consider the further transformation of the first formed optically active products, the relative inefficiency of the optically inactive tissue becomes apparent. If, for example, the glucose in the tissue undergoes a transformation involving interaction with another dissymmetric substance, such as a polymerisation under the influence of a dissymmetric catalyst, then, as we have already seen with our model, the inversion of sucrose, the process should proceed less rapidly in the inactive than in the active tissue to a degree dependent on the order of the reaction involved, provided the concentrations are below those at which the catalyst becomes saturated.

# Chemistry at The British Association Meeting

## New Knowledge on Stereochemistry and Cellulose

Following on the sectional presidential address by Dr. W. H. Mills, the Chemistry Section of the British Association entered into a discussion on the subject of stereochemistry, contributions being forthcoming from Dr. J. Meisenheimer, T. W. J. Taylor and L. E. Sutton, Dr. N. V. Sidgwick, Dr. F. G. Mann, Dr. S. Sugden, and J. D. Bernal (who dealt with crystal structure and stereochemistry).

Dealing with the stereochemistry of oximes, hydroxylamines and amine-oxides, Dr. J. Meisenheimer made an attempt to explain the inconsistency that compounds in which nitrogen is 3-co-ordinate should show stereoisomerism, whilst unsymmetrically substituted tertiary amines have not been found resolvable, although in both types a pyramidal arrangement of the valencies must be assumed. The possibility that the relatively great stability of stereoisomeric oximes is connected with the presence of the hydroxyl-group is excluded by the failure to resolve the substituted hydroxylamines EtNMeOH, $HO_3SC_6H_4$.NMe.OBz. The circumstances under which the co-ordination number 3 is associated with a pyramidal configuration and the causes that determine the stability of a pyramidal arrangement were discussed and stress was laid on the fact that although quinoline oxide shows the greatest similarity to the sulphoxides in the arrangement of electrons round the central atom, it has proved non-resolvable.

### Configurations of the Oximes

According to T. W. J. Taylor and L. E. Sutton the configurations of the oximes have been established by the measurement of the electric moments of certain of their derivatives. For the ketoximes this can be done absolutely from the moments of their N-methyl ethers. In the case of the aldoximes this method cannot be applied, because one and the same N ether is obtained on methylating either of the two isomeric oximes. The two O-methyl ethers of *p*-nitrobenzaldoxime, however, are known, and their relation to their parent oximes is unambiguous. By comparing their moments with those of the O-ethers of the closely related *p*-nitrobenzophenoneoximes, whose configurations are known from the above argument, the configurations of the aldoximes themselves are established. The results show clearly that the modern view as to the configurations of the aldoximes is correct, *i.e.*, that in the reaction used for obtaining configuration, the action of $Na_2CO_3$ on the acetyl compounds, the loss of acetic acid in the $\beta$ series involves groups *anti* to one another, and that the original configurations of Hantzsch and Werner must be reversed. Since it was found previously that the one N-methyl ether of *p*-nitro-benzaldoxime had a moment $6.4 \times 10^{18}$, it appears that the N ethers of aldoximes have the $\beta$ configuration, as has been suspected.

Molecular di-pole moments and intervalency angles was the subject of a contribution by Dr. N. V. Sidgwick, who pointed out that the di-pole moment of a molecule is the vector sum of those of its constituent links; hence if these moments are known, the valency angles can be calculated. Qualitatively it follows that a molecule $AB_3$ if polar ($NH_3$, $PCl_3$) is pyramidal: if non-polar ($BCl_3$) is plane, with angles of 120°. $AB_2$, if non-polar ($CO_2$, $CS_2$, $N_2O$), is rectilinear; if polar ($H_2O$, $H_2S$, $SO_2$) is bent. Quantitatively, by comparing the moment of, say, diphenyl ether with that of its para-di-substitution product, *e.g.*, $(Cl-C_6H_4)_2O$, we can determine the angle between the oxygen valencies (Smyth, Bergmann, Hassel, Sutton). The mutual—electromeric and inductive—effects of the moments can be eliminated by using substituents of different types. The conclusions so far reached are that (1) with valency groups of less than eight electrons, two valencies are approximately at 180° (mercury diphenyl), and three in a plane at 120° ($BCl_3$); (2) with a complete octet the tetrahedral arrangement holds. The angles found are approximately 110° in diphenyl methane, and 130° in benzophenone for the C–C valencies; and 140° in diphenyl ether and thioether for the C–O and C–S valencies. This is in striking opposition to Pauling's theory, which requires smaller angles (about 90°) for oxygen and sulphur.

### Complex Salts of Metals

To this discussion Dr. F. G. Mann contributed chemical evidence on the configuration of the 4-co-valent compounds of the metals of the platinum group. Werner's work on the stereochemistry of complex metallic salts was directed chiefly towards the salts of metals showing a co-ordination number of 6, and the configuration of such compounds is now beyond reasonable doubt. Recent work has therefore concentrated more particularly on the stereochmistry of complex salts of metal showing a co-ordination number of 4. The configuration of the tetrammino metallic complex—whether tetrahedral or uniplanar—is still in doubt, however, since the available experimental evidence remains indecisive. The salient points in this evidence were briefly reviewed, and their significance discussed.

Dr. S. Sugden gave details of a planar configuration of diamagnetic nickel complexes. He said the wave-mechanics valency theory of Pauling gives a correlation between (*a*) the space distribution of valency links; (*b*) the azimuthal quantum numbers of the electron levels taking part in the links; and (*c*) in some cases the magnetic moment of the atoms. Co-ordination complexes of nickel are found to be sharply divided into two groups as regards their magnetic behaviour. One group is paramagnetic, the other diamagnetic. Of the latter the double cyanide $K_2Ni(CN)_4$ and the dimethylglyoxime are the best-known compounds. By

synthesising unsymmetrical glyoximes it has been found that the nickel derivatives occur in two forms, which are interconvertible. These appear to be the cis-trans isomerides required by Pauling's theory of a planar configuration.

### Constitution of the Polysaccharides

On Friday, there was a discussion on the constitution of polysaccharides, with special reference to fibres, to which Professor W. N. Haworth, Dr. Max Berkman, Dr. H. Staudinger, Dr. E. L. Hirst, Professor Dr. H. Mark and W. T. Astbury contributed.

Introducing this subject, Professor W. S. Haworth made a brief historical survey of the development of the constitution of polysaccharides, showing that the occurrence of celloboise as preformed units in cellulose is established by chemical methods, and that the structure of cellulose rests ultimately on the constitution previously assigned to this biose. The mutual linking through position 1 : 4 of $\beta$-glucopyranose units in chain fashion is thus the fundamental principle of modern cellulose structures. Recent work by Haworth and Machemer has indicated that a methylated cellulose can be utilised to gain valuable information (1) as to the character of the chain, whether open or closed, and (2) as to the approximate chain length in this very representative derivative. Tetramethyl glucose, in yield of 0.6 per cent., is obtained by hydrolysis of this specimen, so that the minimum mean value for the chain length of cellulose is given as 200 glucose units. Similar experiments with intermediate hydrolysis products of cellulose have been carried out and their molecular size determined.

### Hydrolysis Products of Cellulose

According to Dr. Max Bergman, who dealt with the molecular weight of cellulose and its intermediate hydrolysis products, evidence of the chain structure of cellulose is derivable from chemical preparative methods, inasmuch as the intermediate products from cellulose hydrolysis contain an aldehyde group, which is indicated by the hypoiodite test. Groups of such intermediate hydrolysis products are in a general sense homogeneous, and determination of their iodine values lead to estimates of their molecular weight, if one makes the assumption that only one aldehyde group is present in the molecule. If one may also adopt the view that native cellulose is a homogeneous product which reacts uniformly with the reagent, then the iodine value affords the best means of estimating the molecular weight of the polysaccharide. Cellulose is closely related in the principles of its structure with the chitin of insects, crustaceans and fungi. By careful hydrolysis it gives rise to chitoboise, whose structure has now been elucidated by special methods. It is quite analogous to that of celloboise; except that the hydroxyl groups in the 2-positions are replaced by amino-groups.

### Colloid Particles of Cellulose

Speaking on the nature and size of the colloid particles of cellulose and related substances, Dr. H. Staudinger said the work of Haworth and his school had shown the mode of linking of glucose units in cellulose. The question of how many such units are combined in the molecule can be answered by investigating the nature and the size of colloid particles of cellulose dissolved in Scheeizer's reagent or of the acetate or nitrate in organic media. These colloid particles are the molecules themselves and, contrary to McBain, Meyer and Mark, have not a micellar character This is shown by the examination of 'polymer homologous series' of break-down products of cellulose, the lower molecular members of which are recognised, by ordinary chemical methods, as thread-molecules of different lengths. Such products also exhibit a relationship between their molecular length and their viscosity in solution. Investigations have been facilitated by the parallel study of synthetic polymeric substances of known constitution. By these methods, cellulose in Schweizer's reagent is found to have mol. wt. 120,000, that is, 750 glucose residues are combined in one molecule. The molecules are long threads which in one dimension are 500 times longer than in the two others.

Dealing with amylose and amylopectin, Dr. E. L. Hirst pointed out that analogues of cellulose, containing mutually linked glucose units, are represented by starch and glycogen. But whereas in cellulose the units are $\beta$-glucopyranose, in starch and glycogen there are $\alpha$-glucopyranose, the model of which does not permit of its forming a straight chain pattern such as is possible with cellulose. No sure evidence has been available as to the size of the molecular unit, and the situation has been rendered complicated by uncertainty concerning the relationships between amylose and amylopectin. It was found that the essential differences between amylose and amylopectin do not depend on the phosphorus content. On careful methylation the special characteristics of each modification were retained in the methylated derivatives. Methylated amylopectin yielded on hydrolysis 5 per cent. of tetramethyl glucose, representing a minimum means chain length of about 25 glucose units for amylopectin. Methylated amylose gave the same amount of tetramethyl glucose, and it would appear that the differences between amylose and amylopectin depend on hydration and micellar structure rather than on length of chain. Similar work on methylated glycogen resulted in a yield of 8.5 per cent. of tetramethyl glucose indicating a minimum chain length of about 12 units for this polysaccharide. Glycogen does not retrograde into an insoluble modification as does amylose, and it would appear that in glycogen the chain length is insufficient to bring about the micellar changes which take place in starch.

### The Space Model of Cellulose

The space model of cellulose was the subject of a contribution by Dr. H. Mark. The question of the structure of cellulose, he said, is an old and fascinating problem of organic chemistry. Many attempts have been made to solve it, but they all failed to reach the final point of linking up structure and properties. The formula of aniline represents to every organic chemist an expression not only of the percentage composition, but also of the properties of the substance. But the expression $(C_6H_{10}O_5)_x$ for cellulose does not represent anything but the percentage composition. There appeared a favourable chance of making progress in regard to the formula of cellulose by building up a model from the molecular point of view. Two stages of new knowledge were necessary. The first step was provided by the very remarkable progress of the researches in the field of sugar chemistry, largely carried on by British chemists. The other was our increased knowledge of the size and shape of molecules, which was mainly the work of Sir William and Professor W. L. Bragg. The combination of these two lines of attack, supported by some results of Freudenberg; rendered it possible to build up a reasonably accurate and detailed model of the cellulose structure which illustrated the peculiarities of its properties and behaviour as a high molecularly substance. Such a combination was first made by Sponsler and Dore, and about two years later with more efficiency by K. H. Meyer and his co-workers.

### Protein Fibres

On the subject of protein fibres and the formation of polysaccharide chains, it was stated by W. T. Astbury that the fruitful combination of the results of organic chemistry with those of X-ray analysis hos now defined with some precision the concept of long-chain molecules in the field both of the polysaccharides and of the proteins. But whereas cellulose appears to be laid down in biological structures as fully extended chains, protein fibres are undoubtedly built up of polypeptide chains in various states of extension. X-rays have as yet revealed only two proteins, the fibroin of natural silk and the $\beta$-keratin of stretched hair, which would appear to be in a fully extended state Since in natural processes the formation of cellulose and other polysaccharides seems to be brought about through the intervention of proteins, the possibility thus arises that the protein chain may act as a pattern or framework down the sides of which sugar units are linked up into a polysaccharide configuration.

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THE trade in by-products of the German potash industry showed a marked downward trend this year with the added difficulties due to continued decline in prices. Total sales of rock salt in the first five months decreased 16 per cent. from the corresponding period of last year; sales of Epsom salts represented a decrease of 35 per cent.; of bromine 45 per cent.; and of magnesium chloride from 30 to 35 per cent.

# Reform of the Food and Drug Laws

## The Complaint of a City Analyst

IN his annual report for 1931-32 Mr. H. E. Monk, the Salford city analyst, complains bitterly, and not without cause, of the provisions of the food and drug laws which are at present operative in this country. He points out that there has been no new legislation during the past year dealing with food and drugs from the point of view of his department, and says that it is a matter for regret that considerations of national economy were responsible for the suspension of the labours of the Departmental Committee on the amendment of food law. The necessity for reform in certain directions was, he recalls, mentioned in his report for 1930-31.

Dealing with the question of mixtures of margarine and butter, he mentions a case in which a vendor sold as "a very good mixture of margarine and butter" a substance containing 4.5 per cent. of butter. As the Food and Drugs Act prohibits the sale of mixtures containing more than 10 per cent. of butter, the Court felt compelled to hold that no offence had been committed, but intimated that, but for this proviso, the decision might have been the other way. It was not pointed out to the judges, however, that the proviso does not apply to mixtures of butter and margarine, but to margarine, and the Act expressly provides that any mixture of butter and margarine must be sold simply as "margarine." As an analyst, Mr. Monk has ventured to criticise this decision as most unfortunate, but it is undoubtedly true that proceedings instituted in respect of such a sample would have practically no chance of success. One may express the hope that if and when the present food and drugs code comes to be revised attention will be given to this matter. The original intention was that there should be two articles only—namely, butter and margarine. Sanction was given to the presence of 10 per cent. of butter in margarine because at that time (1906) blending with skimmed milk had not reached the perfection since attained, and it was possible to obtain a better flavour with the use of butter. The use of butter for this purpose is not necessary to-day. Not even an expert could distinguish the presence of 5 per cent. of butter in margarine by taste alone, and it is doubtful if he could be certain of 10 per cent. At the present time the only reason for the addition of butter is the selling power of the word "butter." It is doubtful if one person in 100 is aware that such mixtures cannot contain more than 10 per cent. of butter, *i.e.*, about 1¼ ounces per pound. "If such mixtures are not forbidden," Mr. Monk concludes, "their labels should be required to state their composition in plain and simple words, such as 'Contains one part of butter to every twenty parts of margarine.'"

On the subject of custard powder, Mr. Monk points out that unless speedy action is taken, modern advertising and salesmanship will succeed in selling us cream custard powder, which consists of 90 per cent. of cornflour or a similar starchy substance, and having no earthly connection with eggs, milk or cream. Writing of samples of jam proved to be below standard, he is of the opinion that extended experience of the jam standards set up by the manufacturers has not bred confidence in them. They are particularly open to criticism in respect of the low percentage of fruit they require to be contained in jams of the first quality—amounts varying from 30 per cent. to 45 per cent. according to the kind of fruit—and in this particular they are undoubtedly the worst standards in the civilised world.

The report also deals at some length with the question of deficiencies in bottled milk, and states that it was suggested to the local milk dealers' association that bottlers should adopt a form of warranty to be printed on the cap, and that the retailer should be given a written continuing warranty. The association, however, was not prepared to adopt this procedure, though one large wholesaler and bottler has stated that he will have the warranty printed on his caps in future.

# Colloids and Textiles

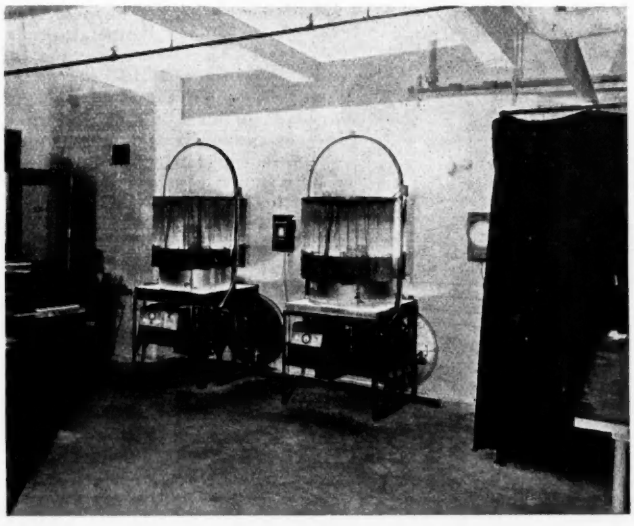
## General Discussion Organised by the Faraday Society

A GENERAL discussion on the colloid aspects of textile materials and related topics will be held by the Faraday Society, at the Department of Chemistry, University of Manchester, September 21 to 23. This meeting has been organised by the Colloid Committee of the Faraday Society, which comprises also representatives from the Royal Society, the Bio-chemical Society, the Chemical Society, the Physical Society, the Physiological Society and the Society of Chemical Industry. Members of these societies are therefore especially invited to attend, but the council of the Faraday Society also extend an invitation to others who may be interested in the subject, including research students. At the inauguration meeting the president of the society (Sir Robert Mond) will introduce the distinguished foreign members and visitors individually to those present. An introductory address will be given by Professor F. G. Donnan. The society will entertain its foreign guests at dinner at the Midland Hotel on Sept. 22.

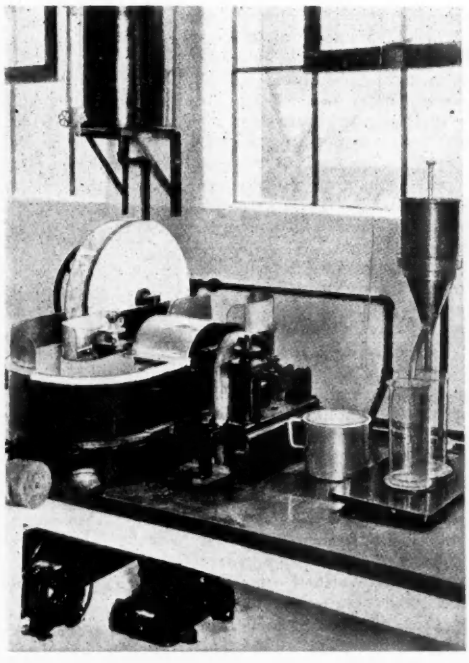
According to the provisional programme, the papers to be presented include "The Fine Structure and Mechanical Properties of Fibres" (Profesor H. Mark, Ludwigshafen); "Molecular Structure of Cellulose and Starch and Similar Polysaccharides" (Professor W. N. Haworth and M. Hirst, Birmingham); "Viscosity Measurements as an Aid to the Investigation of the Constitution of High Molecular Natural Products, such as Rubber and Cellulose" (Professor H. Staudinger, Freiburg); "Relations between the Refractive Indices and the Behaviour of Cellulose Fibres" (J. M. Preston, Manchester); "The Structure of Xerogels of Cellulose and Cellulose Derivatives" (Dr. S. E. Sheppard, Rochester, N.Y.); "The Study by means of X-Rays of the production of Nitrocellulose Fibres" (Dr. J. J. Trillat, Paris); "Surface Films of Cellulose Derivatives in Aqueous Solutions" (Dr. N. K. Adam, London); "The Molecular Aggregation of Nitrocellulose" (Dr. F. D. Miles, West Kilbride); "Lignin its Behaviour as a Permutoid Substance and as the Mould of the Cellulose Fibre" (Professor K. Freudenburg, Heidelberg); "The Emulsification of Mixed Liquids of High Molecular Weight" (Dr. J. B. Speakman, Leeds); "Protein Structure and Protein Hydration" (Dorothy Jordan Lloyd and Henry Phillips, London); "The Structure of Protein Films" (A. H. Hughes, Cambridge); "The Constitution of the Keratin Molecule" (Dr. J. B. Speakman, Leeds); "Some Problems in the X-Ray Analysis of Hair Structure" (Dr. W. T. Astbury, Leeds); "Contribution to the Study of the Ripening of Cotton" (Professor O. Roehrich, Paris); "Chemical Considerations in Relation to Mammalian Hair Growth. Part II. Observations on the Chemico-histological System in Follicle Activity" (Dr. A. T. King and J. E. Nichols); "Connection between Deformation, Size and Form of Fibre Particles, with Special Reference to Artificial Fibres" (Professor Herzog, Berlin); "Swelling and the Roetgenspectrography of Swelling'" (Professor J. R. Katz, Amsterdam); "The Modification of Natural Cotton Cellulose by Swelling and by Degradation" (S. M. Neale, Manchester); "The Swelling of Silk" (Dr. W. S. Denham and E. Dickinson); "The Tensile Properties of Silk Filaments" (Dr. W. S. Denham and Dr. T. Lonsdale); "The Hygroscopic Properties of Silk" (Dr. W. S. Denham and A. L. Allen; "Some Aspects of the Chemical Degradation of Linen Cellulose" (C. R. Nodder, Lambeg); "On the Theory of the Drying Process" (Professor E. Elöd, Karlsruhe); "Some Difficulties in Cotton Yarn Mercerisation" (Professor P. Krais, Dresden); "The Physical Significance of Crimp or Waviness in Wool" (Dr. S. G. Barker, Leeds); "The Electrical Resistance of Wool Fibres" (Dr. M. C. Marsh and Miss K. Earp, Leeds).

# A New Experiment Station in the United States

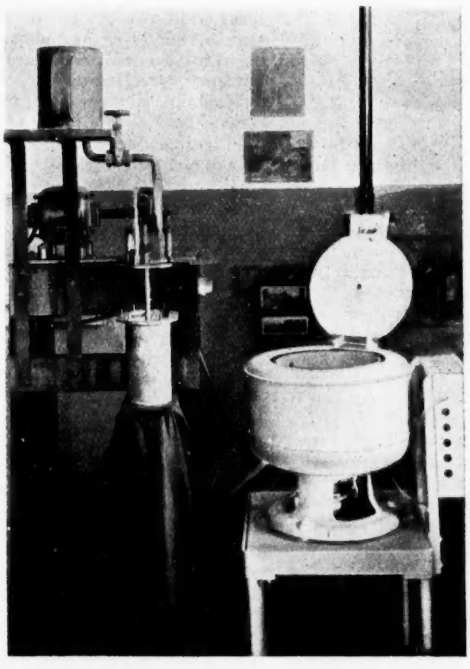
CONSTANT recognition of the fact that research is becoming more and more indispensable for expanding business caused the Hercules Powder Co., of the United States, to undertake the construction of a new experiment station at Wilmington, Delaware. This station comprises a group of eleven buildings, the central feature being a main laboratory which is served by semi-plant units, workshops and smaller laboratories. The equipment which has been installed embodies the most modern ideas and innovations for industrial research. Within, the walls are of glazed tile or plaster, and each laboratory has at least two exits. Drains are of stoneware carried in channels hung from the ceiling, while the pipe service is suspended along the walls independent of desks. Hoods are of transite lumber and stainless metal with sliding doors, and each hood has its own exhaust fan on the roof. The air for the whole building is washed, properly humidified, and circulated under slight pressure. There are photographic dark rooms, a constant temperature room, a vault for low temperature work, several storage rooms, and a well-equipped first-aid room. Lines from the power house are laid in concrete ducts, the covers of which form sidewalks around the grounds and allow easy access at any point. A special building with separate working vaults is provided for experiments involving more than ordinary hazards. Some of the principal features are illustrated below.



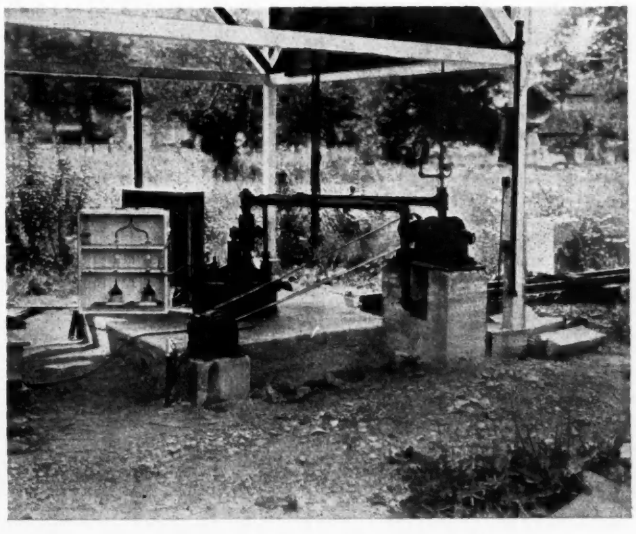
Accelerated Weathering Machines to test Finish Formulæ



Experimental Paper Beating and Pulp Testing Equipment



Small-Scale Nitrator and Wringer for Chemical Cotton and Nitro-cellulose Tests



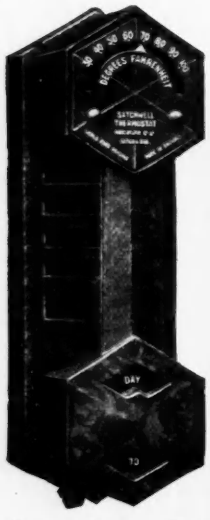
Collecting Gas from an Underground Chamber

# Nickel-Iron Alloys in Temperature Control

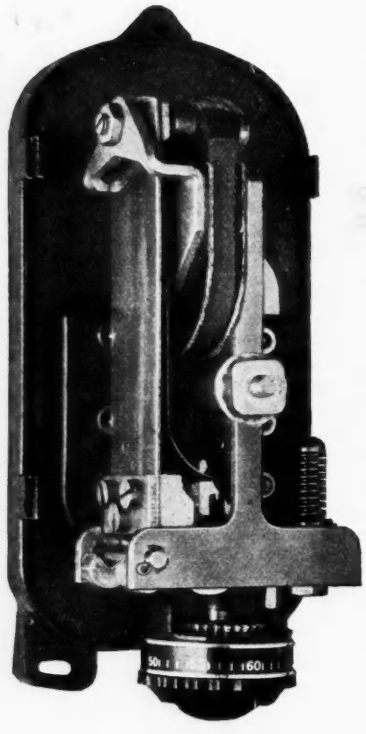
## Thermostats for Two Purposes

THE automatic control of temperature is a subject of vital importance to-day, not only to the manufacturer, who has to maintain accurate control over his industrial processes, but also to everyone who has to work and live in artificially heated buildings. A moment's thought will show that the installation of, for example, central heating in a building, must possess sufficient capacity to maintain a comfortable temperature indoors while outside temperatures may be even below freezing. During the winter months, however, in our climate the temperatures are frequently much above this minimum value; consequently the heating installation, if working to capacity, would prove excessive and result in discomfort to the occupants of the building and most certainly would involve unnecessary wastage of fuel. This situation may be met by the use of proper apparatus for the control of temperature.

Various devices have been evolved from time to time to fulfil this purpose of automatic control of temperature and, amongst others, The Rheostatic Co., Ltd., Slough, has developed and marketed a wide range of temperature controllers, or "thermostats." This range includes instruments which can be used to regulate many forms of heating for industrial purposes. The thermostat consists generally of an electrical switch which is connected to a temperature-sensitive unit so that, as the temperature changes, the electrical switch is caused to open or close as the temperature passes some predetermined critical point. The temperature-sensitive unit utilises the principle of expansion or contraction of a metal with temperature change, but, for mechanical reasons, it is necessary, in order to utilise this movement, that this should be opposed to the movement of another member, and the actual operation of the unit depends on the relative movement of the two parts. This relative movement involves the use of two metals of differing thermal coefficients of expansion, and the more widely different these coefficients can be obtained, the greater will be the effectiveness of the unit and the more sensitive can the instrument be made.

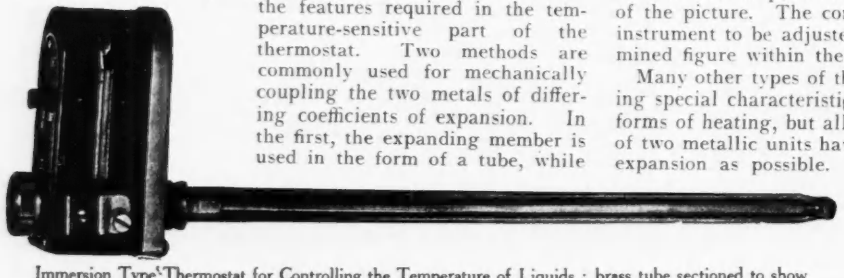



Above: Typical Room Temperature Thermostat, as made by The Rheostatic Co., Ltd.



Right: Room Temperature Thermostat with cover removed

Research work in connection with nickel-iron alloys led to the discovery that the alloy containing 36 per cent. of nickel has a practically negligible coefficient of thermal expansion in the temperature range from normal up to about 200° C. Consequently, the utilisation of this alloy in conjunction with one of the many high-expansion alloys available, provides the features required in the temperature-sensitive part of the thermostat. Two methods are commonly used for mechanically coupling the two metals of differing coefficients of expansion. In the first, the expanding member is used in the form of a tube, while the low-expansion member is employed as a rod fixed to the tube at one end. If the other end of the tube is now held in a suitable support and the tube heated, relative movement will be obtained between the tube and the non-expanding member, and this can then be utilised to operate a suitable form of switch. In the second method, two metals are used in the form of strips which are rolled or brazed together to form a composite strip. If this strip be heated, it will be appreciated that one side expands more than the other, and consequently, the strip tends to bend or warp, the bending being in proportion to the difference in expansion between the two metals used in making the "bi-metal" strip, as it is called.



Immersion Type Thermostat for Controlling the Temperature of Liquids ; brass tube sectioned to show nickle-iron rod

With either of these types of instrument, temperature change can be used for example, in the operation of electric switches. The movement of the switch can then, in turn, be used for the control of the supply of heat. In the first place, for the control of electric heating installations, the thermostatic switch is directly connected in series with the heaters, and will switch the current on or off as the temperature falls below, or rises above, the predetermined figure. For other forms of heating, such, for example, as hot water or steam heating, electrically operated valves are used either on the radiators in each room, or on the main flow pipes from the boiler installation, these valves being connected to the thermostats, so that the hot water or steam flow is regulated according to the temperature requirements.

The accompanying illustrations show two typical thermostats. One is a thermostat as used for controlling the temperature of liquids in such equipment as water heaters, central heating boilers, and for various industrial purposes. The temperature-sensitive unit consists of a tubular stem, within which the nickel-iron rod is clearly seen, the stem being sectioned to show the central rod. This unit is actually immersed in the liquid whose temperature is to be controlled. The knob on the top of the instrument gives a wide range of settings, enabling the instrument to be fixed at any required figure within the available temperature range.

The other instrument illustrated is designed for room temperature control, and is suitable for the control of electric heating loads up to 15 amperes; it may also be used for the control of electro-magnetic valves on steam and hot water systems. Electric contact is made or broken at the end of the bi-metal strip, which is clearly seen on the left hand side of the picture. The control knob at the bottom enables the instrument to be adjusted so that it operates at any predetermined figure within the normal temperautre range.

Many other types of thermostats are manufactured, possessing special characteristics suitable for the control of different forms of heating, but all depend on the differential expansion of two metallic units having as widely different coefficients of expansion as possible. The 36 per cent. nickel-iron alloy possesses by far the lowest coefficient of any known metal, and consequently, its use in this type of equipment is well established in connection with the control of temperature.

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## Sugar from Waste Wood

### Developments in Germany

DEVELOPMENTS in the utilisation of waste wood in forests are reported by the "Frankfurter Zeitung," which states that the Deutsche Bergin A.G. für Kohle and Erdölchemie at Rheinau, near Mannheim, has departed in recent years from its former field of activity, the hydrogenation of coal and oil, and is now occupied with the problem of producing sugar from waste wood in forests. The technical side had already been considered solved for some time, both regarding the manufacture of fodder products and fodder mixtures, and the further refining of the "wood-sugar" to grape-sugar or dextro-glucose. The economic success of the process also appeared to be assured in itself, but further developments depended upon a favourable wood price, from a successful public introduction of the new and cheap fodder, and finally from the financing of extensions of the Rheinau plant or the erection of new large factories elsewhere. The wood-sugar produced by the process of the company is regarded as a cheap basic material for the production of yeast, alcohol and other products of fermentation.

## Iron and Steel Institute

### First Joint Meeting with Institute of Metals

ABOUT thirty-one papers are to be read at the first joint meeting of the Iron and Steel Institute and the Institute of Metals, which will take place in London, September 12-15. At the opening session on Monday evening, Dr. H. J. Gough, of the National Physical Laboratory, will deliver the annual autumn lecture of the Institute of Metals, his subject being "Corrosion Fatigue in Metals."

Papers to be read before the Iron and Steel Institute include "The Equilibrium of Certain Non-Metallic Systems" (Andrews and Maddocks); "The Effect of Hydrogen sulphide on the Corrosion of Iron by Salt Solutions" (Britton, Hoar and Evans); "The Endurance Limit of a 0.33 per cent. Carbon Steel at Elevated Temperatures" (Cuthbertson); "Metallurgical Problems arising from Internal Combustion Engine Valves" (Handforth); "The Fatigue Resistance of Unmachined Forged Steels" (Hankins and Becker); "Time-Potential Curves on Iron and Steel and their Significance" (Hoar and Evans); "A Further Contribution on the Constitution of the Fe-C-Si System (Kriz and Poboril); "Light-Weight High-Pressure Gas Cylinders" (Marsh); "Nickel-Chromium-Silicon Cast Irons" (Norbury and Morgan); "Veining or Sub-Boundary Structures" (Northcott); "Spectroscopic Estimation of Nickel, Manganese and Chromium in Steels" (Twyman and Harvey); "The Generation of Steam from Blast-Furnace Gas" (Webber); "The Growth of Austenite in Plain Carbon Steels" (Whiteley); "Scale Removal by Acid Pickling" (Winterbottom and Reed).

Papers to be read before the Institute of Metals include "The Effect of Pressure on the Liberation of Gases from Metals with Special Reference to Silver and Oxygen" (Allen); "Mould Materials for Non-Ferrous Strip Ingot Casting" (Bailey); "The Properties of Commercial Varieties of Copper at High Temperatures" (Bamford); "Modern Works Plant and Equipment for the Hot Working of Nickel and Nickel Alloys" (Barclay, Russell and Williamson); "A Modified Impingement Corrosion Apparatus" (Brownsdon and Bannister); "The Effect of Different Elements on the Annealing and Grain Growth Characteristics of Alpha Brass" (Cook and Miller); "Some Reactions Occurring in 'Hot-Dipping' Processes" (Daniels); "Atmospheric Action as a Factor in the Fatigue of Metals" (Gough and Sopwith); "On the Removal of Gases from Aluminium Alloys by Mixtures of Nitrogen and Volatile Chlorides" (Grogan and Schofield); "Two Years' Corrosion Tests with Duralplat in the North Sea" (Meissner); "Some Attempts at Making Beryllium-Magnesium Alloys" (Payne and Haughton); "Mechanical Properties of Nickel Wire" (Ransley and Smithells); "Researches on Beryllium" (Sloman); "The Constitution of the Lead-Tin Alloys" (Stockdale); "The Distortion of Wires on Passing Through a Draw Plate" (Taylor and Quinney); "The Open-Air Corrosion of Copper. Part III. Artificial Production of Green Patina" (Vernon); "Liquation, or 'Inverse Segregation'" (Watson).

## Hydrogenation in the United States

### Successful Completion of Hydro Patents Plan

COMPLETION of the plan undertaken by the Standard-I.G. Co. in 1930 to pass control of the hydrogenation process in the United States into the hands of the oil industry of that country has been effected at a special meeting of the Hydro Patents Co. stockholders. Under this plan the Hydro patents Co. was organised originally by the Standard Oil Co. (New Jersey), the controlling stockholder in the Standard-I.G. Co. The stock of Hydro patents was then offered to all oil-refining companies of sufficient size to make them potential users of hydrogenation, and was accepted by over 90 per cent. of such companies. Under the original offer the permanent participation of the new stockholders was contingent upon their taking licences for the process after investigation, and further contingent upon licences being taken by companies having at least 1,467,850 barrels of daily crude capacity, representing more than one-half of the potential capacity in which the process could be applied in the United States. The licence permitted, but did not require, the licensee to use the process, but did require technical co-operation and created a full community of interest in all improvements.

The term for the investigation of the process expired on July 1, 1932, and as of that date fifteen large companies had accepted the plan and become permanent stockholders of the Hydro Patents Co. Since the total crude running capacities of these companies is far in excess of the minimum required under the plan, the plan became automatically operative and was put into effect by the special stockholders' meeting and by the election of new directors, replacing the original board of Standard Oil Co. (New Jersey) representatives. The successful completion of the Hydro Patents plan therefore represents so far as is known the first instance in which a basic industry has created the necessary business machinery to prevent internal litigation and provide for co-operative development and control of a fundamental new process. The Hydro Patents Co. is obligated, by its agreement with the Standard-I.G. Co., to follow the policy of granting licences on a non-stockholder basis to all applicants, without discrimination, and upon uniform and reasonable terms.

## National Smoke Abatement Society

### Annual Conference

THE annual conference of the National Smoke Abatement Society will be held, by the invitation of the corporation, at Newcastle-upon-Tyne, September 23 to 25. An instructive programme has been arranged, and it is hoped that many members and representatives will attend. The conference will be opened by the Lord Mayor of Newcastle, Councillor J. G. Nixon, J.P., at a reception to be held at the Laing Art Gallery, on Friday evening, September 23. On Saturday morning the annual general meeting of the Society will take place, and will be followed by a paper by Mr. R. A. Mott, of Sheffield University, on "Domestic Smoke Problem: the Possibilities of Coke Oven Fuel," when Dr. J. T. Dunn, of Newcastle, will preside. On Sunday morning papers will be read by Alderman David Adams, chairman of the Newcastle Health Committee and a member of the Society's Executive, on "The Psychological Effects of Smoke"; and by Mr. A. E. Crossley, chief smoke inspector, Manchester, on "The Human Factor in Smoke Abatement." At this meeting Sir Thomas Oliver will preside. The conference headquarters will be the Royal Station Hotel. In consequence of a general wish to have more complete records of the proceedings of the conference it has been agreed to increase the usual fee to 10s. 6d. for each member or delegate.

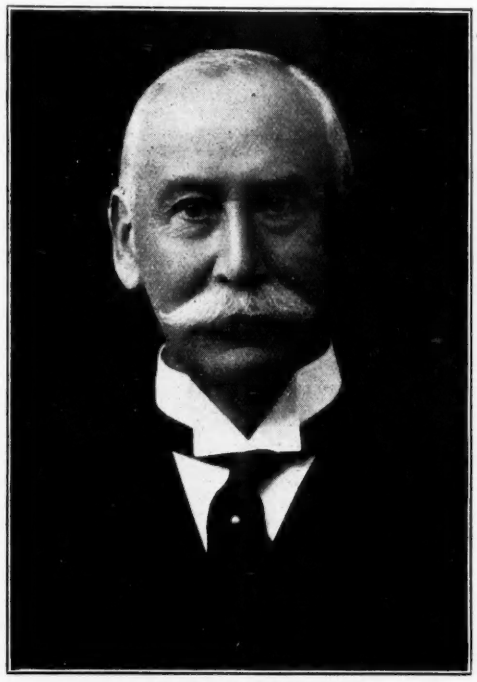
### Alkali Industry Anticipated for Australia

RECENT statements indicate interest in establishing an alkali industry in South Australia, notwithstanding the recent recommendations of tariff freedom for soda ash by the Australian tariff board. The trade has been largely from Great Britain and East Africa and imports of soda ash during recent years were approximately as follows: 1926-27, 25,600 tons; 1927-28, 31,000 tons; 1928-29, 27,000 tons; 1929-30, 17,700 tons.

# A Leader of the Chemical Industry

## The Late Sir William Pearce

SIR WILLIAM PEARCE, whose death at the age of 79, at his residence, Shepway Lodge, Walmer, Kent, on August 24, was briefly announced in THE CHEMICAL AGE last week, was a leader in the chemical industry. He was born at Poplar on March 18, 1853, and, after education at the Royal College of Chemistry and School of Mines, entered his father's chemical manufacturing business in East London. In 1892 he entered the London County Council and sat until 1901, rendering useful service on the Technical Education Committee. He contested the Limehouse Division for the House of Commons unsuccessfully in 1900, but was elected at his second candidature in 1906. In the House his knowledge and experience were of particular service in the preparation of the Port of London Bill. He was knighted in 1915. The chemical works established in 1837 at Bow Common by his father, the late Mr. William Pearce, were among the earliest of the kind to be founded in London, and Sir William naturally became associated with them and in due course succeeded his father. Thirty years ago the business was amalgamated with that of Spencer, Chapman and Messel, Ltd., and for a considerable period Sir William was associated in the general management with Dr. Messel who, upon his death, left his fortune to the Royal Society and the Society of Chemical Industry for public purposes.



SIR WILLIAM PEARCE

Sir William Pearce was Member of Parliament for Limehouse from 1906 until 1922, and was often referred to as "the member for the chemical industry." He was a member of the Advisory Committee both of the Board of Trade and the Department of Overseas Trade, and by special request he sat on the committee dealing with export credits. Other offices which he filled included those of Parliamentary Secretary to the Association of Chambers of Commerce, vice-president of the Federation of British Industries, treasurer of the Association of British Chemical Manufacturers and governor of the Imperial College of Science (on the nomination of the Society of Chemical Industry) Sir William Pearce had a large share in persuading the Government that the passage of the Dyestuffs (Import Regulation) Act was imperative if the newly-founded dyestuffs industry was to be saved from extinction and in urging upon them the claims of young British chemical industries to be safeguarded, at least for a time, against ruinous foreign competition.

The funeral service was held on August 27 at the Garrison Church, Depot Royal Marines, Walmer. Amongst those present were Captain D. S. Peploe, managing director, Mr. P. R. Goodwin, secretary, Mr. Henry Clark, Mr. English, Mr. Heathcote and Mr. F. Martin Smith, directors, representing Spencer, Chapman and Messel, Ltd., of which company Sir William Pearce had been a director for many years.

# Chemical Industry Lawn Tennis Tournament

## Arrangements for the Final

APART from the playing off of one of the two semi-final matches, which has had to be postponed until Monday next on account of holidays, arrangements have now been completed for the final of the Chemical Industry Lawn Tennis Tournament, for THE CHEMICAL AGE Silver Challenge Cup, which is to be played at Blunt House, Oxted, by invitation of Sir Ernest and Lady Benn, on Saturday next, September 10.

In addition to THE CHEMICAL AGE Cup, which is held by the winners for twelve months, there are four miniature cups to be awarded outright, one each for the winners and one each for the runners-up. The miniature cups for the winners have been presented by Johnson Matthey and Co., Ltd., of 73/82 Hatton Garden, London. These cups are of silver, platinum plated by a process which renders them untarnishable and stainless. The cups for the runners-up are of silver and are presented by Thomas Duxbury and Co., London.

Invitations to attend the final match have been addressed to a large number of tennis enthusiasts in the chemical industry, but as it is possible that some may have been inadvertently overlooked, an invitation is extended to any who are interested. It is essential, however, that readers should inform the Editor of THE CHEMICAL AGE not later than first post on Tuesday next, September 6, of their intention to be present. Sir Ernest and Lady Benn will receive the guests at 2.30 p.m., and the match will commence at 3 p.m. sharp.

For the information of those travelling from London to Oxted by rail, convenient trains run as follows:—

| Leave Victoria. | Leave London Bridge. | Arrive Oxted. |
|---|---|---|
| 12.46 | 12.48 | 1.37 |
| 1.26 | 1.16 | 2.3 |
| 1.47 | 1.58 | 2.45 |
| 2.30 | 2.25 | 3.9 |

Trains leave Oxted for London at 4.37, 5.34, 7.8, 7.27 and 9.30 p.m.

For those who are travelling by road, the best route is via Brixton, Streatham Hill, Streatham, Norbury, Croydon, Waddon, Purley, Kenley, Whyteleaf, Warlingham and Caterham, turning left at Tyler's Green.

Clashing of holiday arrangements necessitated the postponement of one of the semi-final matches until Monday next. The other semi-final was played in London on August 13, when S. E. Chaloner and W. Speakman (Monsanto Chemical Works, Ltd., Ruabon) defeated their London colleagues, J. W. Urban and F. S. Mortimer (Monsanto Chemical Works, Ltd., London) by 3-6, 6-4, 6-1. Chaloner and Speakman will therefore play in the final against the winners of the following tie, to be played next Monday:—

C. G. Copp and W. W. Marchant (Doulton and Co., Ltd.) v. G. F. Hammond and L. Giltrow (Williams (Hounslow), Ltd.)

# News from the Allied Industries

### Soap

MR. C. H. HAMILTON, chairman of Wm. Gossage and Sons, Ltd., stated last week that a communication had been made concerning the early closing of the Widnes works. It is understood that efforts will be made to place the workers between certain ages with other associated branches of the company. Others may be given a gratuity, and it is expected those who have reached the age of 55 will retire on pension. This has already been done in a number of cases, while many of the younger workers have been taken on at Crosfields', at Warrington, or Lever's works at Port Sunlight.

### Rubber

THE DIRECTORS OF THE TONGHURST RUBBER ESTATES are submitting to shareholders a reconstruction scheme involving the formation of a new company, with a capital of £37,500 in 2s. shares, which will take over the assets and liabilities of the existing company. Under the scheme shareholders are entitled to one share, 1s. 6d. paid, for every two shares now held, and debenture-holders are to receive, in satisfaction of all claims, fully-paid ordinary shares in the new company of a nominal value equal to the principal secured by the debentures, plus accrued interest up to June 30, 1932.

### Mineral Oil

EXTENSIVE NEW OIL-BEARING REGIONS in the North Caucasus have been revealed by recent geological explorations and finds in the districts of Kayakent and Malgobek are regarded as of special importance. The Kayakent district is intersected by the North Caucasian Railway, and the city of Kayakent is only about forty miles from Makhach-Kala, a port on the Caspian Sea which possesses several oil-refining plants. The Kayakent deposits extend to 4,000 acres, and the oil has been found to contain up to 35 per cent. of benzine.

### Calico Printing

THE PRELIMINARY STATEMENT of the Calico Printers' Association, Ltd., has now disclosed that the year's working has shown a profit of £157,458. A dividend on the £3,016,104 preference stock, consideration of which was deferred last February until the full year's trading results were ascertained, will therefore be paid at the full rate of 5 per cent., and there will remain the sum of £10,476 to be carried forward, as against £3,823 brought in. For the third year in succession, holders of the £2,010,736 of ordinary stock have to forego a distribution, but they will be much reassured by the sharp recovery of the Association's fortunes. Twelve months ago the directors had to report a net loss of £175,289, and £300,000 was drawn from reserves to wipe off the year's loss and maintain the preference dividend. The general reserve was reduced to £850,000, and a reserve of £250,000 for equalisation of dividends was completely absorbed. The preliminary figures now issued show that the sum of £359,970 has been provided for maintenance, depreciation, repairs, renewals and upkeep, compared with £382,540.

### Safety Glass

THE ACCOUNTS OF TRIPLEX SAFETY GLASS, LTD., for the year ended June 30 last follow a previous announcement that the dividend is maintained at 10 per cent., and show certain provisions in preparation for the proposal to halve the capital of £400,000 by making a return of 10s. per £1 share. Net profit for the year was £30,836, a slight reduction on the previous year's figure of £34,495. There has been considerable rearrangement of the balance sheet, in the course of which certain assets have been written down to nominal figures and other preparations made in anticipation of the annual meeting agreeing to the proposed return of capital. Improved methods of manufacture have resulted in an exceptionally heavy charge for obsolescence, for which £21,929 is charged against profits. During the past year, advantage was taken of the fluctuations of the company's investments, yielding a profit of £38,161. This, added to the credit of profit and loss account, has enabled the directors to write down to a nominal figure of £3 three items comprising (a) goodwill, patents, trade marks and secret processes; (b) shares in subsidiary companies; and (c) amount owing by Triplex Continental, Ltd., to the parent company, which together totalled £51,317.

### Matches

THE SWEDISH STATE COUNCIL have prolonged the Swedish Match Company's moratorium until the end of November. The report of the Swedish Match Reconstruction Committee (THE CHEMICAL AGE, August 27, p. 208) stated that, as it was not expected that all the creditors would have signified their definite acceptance of the reconstruction scheme by yesterday (when the moratorium expired), the administrators would ask for three months' prolongation. So soon as the moratorium has been definitely ended, notice will be given when the resumption of interest payments on the company's bonded indebtedness may be expected.

## Catalytic Production of Ketene

### Investigations at Amsterdam

OUT of the very large number of organic compounds which split off ketene when heated to a high temperature, only acetone and acetic anhydride enter into practical consideration. Owing furthermore to the fact that ketene is likely to become an important intermediate in the manufacture of acetic anhydride, interest now centres chiefly on the splitting-up of acetone into ketene with formation of methane as a by-product. The earliest published account of the preparation of ketene appears to be that of Schmidlin and Bergmann ("Berichte," 1910, *43*, 2821), since when numerous methods have been announced. Reference may be made, for example, to Brit. Pat. No. 232,753 of the Ketoid Co. covering the use of methyl sulphates as catalysts and Ger. Pat. No. 530,423, of E. Berl, which refers to the catalytic action of the oxides of vanadium, cerium, thorium, tungsten and aluminium.

Work on the efficiency of different catalysts and fillings in the formation of ketene by pyrolysis of acetone has recently been carried out in the Amsterdam laboratories of the N. V. De Bataafsche Petroleum Maatschapi. It appears from this investigation that a yield of 90 per cent. ketene can be obtained at a maximum temperature of 675° to 690° C. A favourable influence on the yield is exercised by the presence of quartz fillings in the reaction chamber. Another important observation was to the effect that although quartz filling is preferable to pumice, the highest yield was got in the presence of pumice coated with vanadium oxide.

## Canadian Gypsum

### Important Developments Reported

ACCORDING to a review of the gypsum industry issued by the Dominion Department of Mines at Ottawa, Canada continued to be an important exporter of crude gypsum during 1931, although the exports of gypsum products declined somewhat as compared with those of the previous year. Important developments were recorded during the year. The Canadian Gypsum Co., Ltd., placed in operation its newly erected wallboard plant at Hillsborough, New Brunswick, and opened a new plant at Hagersville, Ontario. The opening of the latter plant is of considerable interest to the gypsum industry, as it marks the first time in Canada that complete calcination has been carried out in a continuous rotary calcining kiln.

The use of gypsum in the building trades is making rapid progress, but owing to its close dependence on constructional activities, any decrease in building contracts is almost immediately reflected on the gypsum output. As the larger portion of the Canadian production is shipped to the United States in the crude state for manufacture into gypsum products, industrial conditions in that country also have a bearing on the Canadian industry. Nova Scotia is still the largest producers of gypsum in Canada, followed by New Brunswick, Ontario, Manitoba and British Columbia. Gypsum is marketed in various forms, and an increasing proportion of the calcined material each year enters into the manufacture of wallboard, gypsum blocks, insulating material and acoustic plaster.

# Weekly Prices of British Chemical Products

## Review of Current Market Conditions

The following notes on the chemical market conditions in Great Britain are based on direct information supplied by the British manufacturers concerned, and unless otherwise qualified the figures quoted apply to fair quantities, net and naked at makers' works. Where no locality is indicated, the prices are general for the United Kingdom. Particulars of the London chemical market are specially supplied to THE CHEMICAL AGE by R. W. Greeff and Co., Ltd., and Chas. Page and Co., Ltd., and those of the Scottish chemical market by Chas. Tennant and Co., Ltd.

CONDITIONS in the London chemical market are practically unchanged, there being a moderate demand for most products. Prices continue steady with a healthy undertone, with the exception of citric and tartaric acids, which remain easy. The failure to avoid a strike in the weaving section of the Lancashire cotton trade has been a disappointing factor on the Manchester chemical market this week. Up to the present, however, the stoppage of the majority of the mills has not made a great deal of difference to the trading position, though if the trouble continues for any length of time the consumption of chemicals in the dyeing and finishing trades is bound to suffer. Meanwhile, although most products have kept steady there has been a shading of prices in one or two lines. There has been a slight improvement during the week in the Scottish heavy chemical market.

### General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £37 5s. to £39 5s.; pure 80% £38 5s. to £40 5s.; tech., 40%, £19 15s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. SCOTLAND: Glacial 98/100%, £48 to £50; pure 80%, £38 5s.; tech. 80%, £37 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in one-ton lots upwards.

ACID, CHROMIC.—11d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—1s. 0½d. per lb. LONDON: 11½d. less 5%. MANCHESTER: 11¾d. to 1s.

ACID, CRESYLIC.—97/99%, 1s. 5d. to 1s. 7d. per gal.; 99/100%, 1s. 9d. to 2s.

ACID FORMIC.—London: £48 per ton.

ACID, HYDROCHLORIC.—Spot, 3s. 9d. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s per ton; 50% by weight, £28 10s.; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £220 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £45 10s. per ton in casks, £48 10s. to £52 10s. in kegs. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £47, ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations: 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—11½d. per lb. SCOTLAND: B.P. crystals, 1s. 1d. to 1s. 1¼d., less 5%, carriage paid. MANCHESTER: 11½d. to 1s.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON: £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA LIQUID.—SCOTLAND: 80°, 2¾d. to 3d. per lb. d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £36 per ton; powdered, £38, in 5-cwt. casks d/d U.K. stations or f.o.b. U.K. ports.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £22 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 4d. to 1s. 6d. per lb. according to quality.

ARSENIC.—LONDON: £24 10s. c.i.f. main U.K. ports for imported material; Cornish, nominal, £26 f.o.r. mines. SCOTLAND: White powdered £27 ex wharf; spot, £27 10s. ex store. MANCHESTER: White powdered Cornish, £25 at mines.

ARSENIC SULPHIDE.—Yellow 1s. 6d. to 1s. 8d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£7 10s. per ton f.o.r. London, packages free.

BLEACHING POWDER.—Spot 35/37% £7 10s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated £15 10s. per ton, power £17, packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—3s. 6d. to 3s. 9d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot £5 5s. to £5 15s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—4½d. to 5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£45 to £55 per ton, drums extra.

CHROMIUM OXIDE.—10d. to 10½d. per lb. according to quantity d/d U.K. Green 1s. 2d. per lb.

CHROMETAN.—Crystals 3⅞d. per lb. Liquor £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r, or ex works.

CREAM OF TARTAR.—LONDON: £4 7s. 6d. per cwt.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£46 to £50 per ton.

LEAD, ACETATE.—LONDON: White, £34 per ton. Brown £1 per ton less. SCOTLAND: White Crystals £40 to £41 c.i.f. U.K. ports. Brown, £1 per ton less. MANCHESTER: White, £33 10s. Brown, £32.

LEAD NITRATE.—£28 per ton. MANCHESTER: £28.

LEAD, RED.—SCOTLAND: £28 10s. per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £40 per ton carriage paid.

LITHOPONE.—30%, £19 to £21 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£52 per ton d/d.

NICKEL SULPHATE.—£52 per ton d/d.

PHENOL.—Small lots 6¼d. to 6½d. per lb. in 3-cwt. drums, bulk quantities down to 5½d. per lb., delivery free U.K.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £40.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5⅞d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CARBONATE.—SCOTLAND: 96/98% spot £28 per ton ex store. LONDON: £31 10s. to £32. MANCHESTER: £30.

POTASSIUM CHLORATE.—3¾d. per lb. ex wharf London in 1-cwt. kegs. LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100% powder, £34. MANCHESTER: £37.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £28 per ton c.i.f. U.K. ports. Spot £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8¼d.; B.P., 9d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 9d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £6 per ton f.o.r in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76/77° spot, £14 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums £18 15s. in casks. Solid 76/77% £14 10s. in drums 70/72% £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £12 15s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£21 to £22 per ton.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d/ 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—2¾d. per lb. LONDON: £29 per ton. MANCHESTER: £29.
SODIUM CHROMATE.—3½d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals £15 ex station 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM NITRITE.—Spot, £19 to £22 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 to £15 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 6d.
SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground Spot £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums. Crystals Spot £7 15s. per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £16 per ton f.o.b.
SULPHUR.—£12 5s. per ton. SCOTLAND: Flowers, £12 10s.; roll, £12; rock, £9. Ground American, £12 ex store.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 5s. to 5s. 3d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON and SCOTLAND: £12 per ton.
ZINC SULPHIDE.—1s. to 1s. 2d. per lb.

## Pharmaceutical and Fine Chemicals

ACID, CITRIC.—11d. per lb.
ACID, TARTARIC.—11¼d. per lb.
BISMUTH SALTS.—Carbonate, 6s. 6d. per lb.; citrate, 8s. 10d.; nitrate (cryst.), 4s. 4d.; oxide, 10s.; salicylate, 7s. 3d.; subchloride, 9s. 10d.; subgallate, 6s. 11d.; subnitrate, 5s. 8d.
POTASSIUM CITRATE.—1s. 6d. per lb.
SODIUM CITRATE, B.P.C. 1911.—1s. 3d. per lb.; B.P.C. 1923 and U.S.P.X 1s 7d per lb.

## Essential Oils

ALMOND, FOREIGN, S.P.A.—11s. 6d. per lb.
ANISE.—2s. per lb.
BERGAMOT.—11s. per lb.
BOURBON GERANIUM.—26s. 6d. per lb.
CAMPHOR, WHITE.—£4 15s. per cwt.
CITRONELLA OIL, JAVA.—3s. 3d. per lb.
LEMON.—6s. per lb.
LEMONGRASS.—2s. 3d. per lb.
PEPPERMINT, JAPANESE.—4s. per lb.
PETITGRAIN.—5s. 6d. per lb.

## Intermediates and Dyes

IN the following list of Intermediates delivered prices include packages except where otherwise stated:—

ACID, BENZOIC, B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.
*o*-CRESOL 30/31° C.—£2 6s. 5d. per cwt., in 1-ton lots.
*m*-CRESOL 98/100%.—2s. 9d. per lb., in ton lots.
*p*-CRESOL 34.5° C.—1s. 9d. per lb., in ton lots.
DICHLORANILINE.—2s. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8½d. per lb.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 9d. per lb.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £75 per ton in 1-ton lots, d/d buyer's works.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
*o*-NITRANILINE.—5s. 10d. per lb.
*m*-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
*p*-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
*o*-TOLUIDINE.—Spot, 9½d. per lb., drums extra, d/d buyer's works.
*p*-TOLUIDINE.—Spot, 1s. 11d. per lb., d/d buyer's works.
*m*-XYLIDINE ACETATE.—3s. 6d. per lb., 100%.

## Coal Tar Products

ACID, CARBOLIC (CRYSTALS).—5½d. to 6¾d. per lb. Crude, 60's 1s. 5¼d. to 1s. 6¼d. per gal. SCOTLAND: Sixties, 1s. 7d. to 1s. 8d.
ACID, CRESYLIC.—99/100, 1s. 7d. per gal.; B.P., 1s. 10d. to 2s.; Refined, 1s 8d. to 1s. 10d.; Pale, 98%, 1s. 6d. to 1s. 7d.; Dark, 1s. 3d. to 1s. 4d. LONDON: 98/100%, 1s 6d. Dark 95/97%, 1s. 4d. SCOTLAND: Pale 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 8½d. to 9d. per gal. Standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 5d. Pure, 1s. 7d. to 1s. 8d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motors, 1s. 3½d. to 1s. 4½d.; 90%, 1s. 9½d. to 1s. 10½d.
CREOSOTE.—Standard for export, 4¾d. to 5d. nett per gal. f.o.b. for Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 3d. to 4d. SCOTLAND: Specification oils, 3¾d to 4¼d.; washed oil, 4d. to 4½d.; light, 3¾d. to 4¼d.; heavy, 4½d. to 5d.
NAPHTHA.—Solvent, 90/160, 1s. 4d. to 1s. 5d. per gal.; 95/160, 1s. 5d.; 90/190, 1s. 1d. to 1s. 2d. LONDON: Solvent, 1s. 1½d. to 1s. 2d.; heavy, 11d. to 1s 0½d. f.o.r. SCOTLAND: 90/160, 1s. 3d. to 1s. 3½d.; 90/190, 1s. 1d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £9 10s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 65s. to 70s.
PITCH, MEDIUM, SOFT.—95s. to 97s. 6d. per ton.
PYRIDINE.—90/140, 3s. 9d. per gal.; 90/160, 4s. to 4s. 6d.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 3s. to 4s.
REFINED COAL TAR.—SCOTLAND: 4¾d. to 5d. per gal.
TOLUOL.—90%, 2s. 1d. to 2s. 2d. per gal.; Pure, 2s. 5d. to 2s. 6d.
XYLOL.—1s. 9d. per gal.; Pure, 1s. 11d.

## Wood Distillation Products

ACETATE OF LIME.—Brown, £8 5s. per ton. Grey, £10 10s. to £12. Liquor, brown, 30° Tw., 6d. per gal. MANCHESTER: Brown, £8 10s.; grey, £11 10s.
ACETIC ACID, TECHNICAL, 40%.—£16 10s. to £18 per ton.
ACETONE.—£63 to £65 per ton.
AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.
CHARCOAL.—£6 10s. to £11 per ton.
IRON LIQUOR.—24°/30° Tw., 10d. to 1s. 2d. per gal.
WOOD CREOSOTE.—6d. to 2s. per gal., unrefined.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 4s. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.
WOOD TAR.—£2 to £6 per ton.
BROWN SUGAR OF LEAD.—£32 per ton.

## Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The export market continues quiet and the price is unchanged at £4 10s. per ton for prompt shipment f.o.b., U.K. ports. The home market remains quiet at £5 5s. per ton for delivery in 6-ton lots to farmer's nearest station. It is understood that a great number of merchants have covered their requirements in respect of this commodity.
NITRATE OF SODA.—The announcement of the new scale of prices for 1932-33 was received without much interest, and very little buying has been reported.
NITRO-CHALK.—The price remains unchanged at £7 5s. per ton delivered in 6-ton lots.

## Latest Oil Prices

LONDON, August 31.—LINSEED OIL was firm. Spot, small quantities, £19; Sept., £15 12s. 6d.; Sept.-Dec., £16; Jan.-April, £17; May-Aug., £18 per ton, naked. RAPE OIL was steady. Crude, extracted, £29; technical refined, £31 per ton, naked, ex wharf. COTTON OIL was quiet. Egyptian, crude, £23; refined common edible, £26; and deodorised, £28 per ton, naked, ex mill. TURPENTINE was firm. American, spot, 62s. 3d. per cwt.
HULL.—LINSEED.—Spot, £16 2s. 6d.; Aug., £15 12s. 6d.; Sept.-Dec., £15 15s.; Jan.-April, £16 15s. per ton. COTTON OIL.—Egyptian crude, spot, £23 10s.; edible refined and technical, £25 10s.; deodorised, £27 per ton, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £22 per ton, naked. GROUNDNUT OIL.—Crushed-extracted, spot, £30 10s.; deodorised, £34 10s. per ton. RAPE OIL.—Crushed-extracted, £28; refined, £29 10s. per ton. SOYA OIL.—Crushed-extracted, spot, £23 10s.; deodorised £26 10s. per ton. COD OIL, 15s. 6d. per cwt., in barrels. CASTOR OIL.—Pharmacy, spot, in barrels, 41s. 6d.; first, 36s. 6d.; second, 31s. 6d. per cwt. TURPENTINE.—American, spot, 62s. 6d. per cwt.

# Inventions in the Chemical Industry

## Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications Accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### De-Nitrating Waste Acid

WASTE acid comprising sulphuric and nitric acid and dissolved nitro-bodies, such as obtained in nitrotoluene manufacture, is denitrated by treatment with steam, with or without hot gas, the amount of steam being such that a nitric acid is obtained in the condensing stage of such a concentration, say, 20 to 30 per cent. by weight, that complete separation of nitro bodies therefrom can be attained by cooling. Alternatively, the necessary concentration may be attained by diluting the condensed nitric acid. (See Specification No. 365,949, of Dr. H. Pauling.)

### Light-Fast Lithopone

CALCINED lithopone is treated with phosphoric acid, or with substances which yield free phosphoric acid in solution, so as to neutralise the alkalinity and any harmful excess of zinc oxide, and to increase the fastness to light even in the presence of relatively large amounts of chlorides. The lithopone may also be treated with phosphoric acid before calcination. In examples, the calcined lithopone is suspended in water, treated with a dilute solution of phosphoric acid, filtered, and dried. Sodium di-hydrogen phosphate may be used, also ortho-, meta-, and pyro-phosphoric acids and their acid salts. (See Specification No. 370,121, of J. Guillissen and Union Chimique Belge Soc. Anon.

### Anti-Knocking Motor Fuels

MOTOR fuels are rendered anti-knocking by the addition of an iron carbonyl and an amine prepared by passing a crude phenol and ammonia over a dehydrating catalyst, such as aluminium hydroxide, at pressures above atmospheric pressure and at a temperature above 400° C. Suitable crude phenols are those contained in crude benzines from destructive hydrogenation products of hard coal, brown-coal or peat or tars therefrom such as brown-coal tar. The aluminium hydroxide used may be compacted by making into a paste, drying and heating with phosphoric acid or aluminium nitrate. (See Specification No. 368,373, of J. Y. Johnson, a communication from I. G. Farbenindustrie.)

### Purification of Tar Oils

COMPLEX phenols, pyridine bases and amines contained in a natural or artificial mixture with hydrocarbons, such as a low temperature tar, are extracted from the mixture by means of liquid ammonia. The mixture may be shaken with the liquid ammonia and the two layers formed may be separated as liquids or cooled and the liquid layer containing the ammonia and the extracted phenols and bases decanted off from the solid neutral oil. The separation of the following mixtures into neutral oils and "phenol" oils is described. An artificial mixture of phenol and neutral oil: a low temperature tar; a raw tar obtained by distilling an oil-containing slack; a raw tar obtained by low temperature distillation of an oil-containing slack; raw tar from an oil-containg tar and a paraffin oil obtained from raw tar. (See Specification No. 360,785, of R. M. Jarry.)

### Synthetic Resins

A WATER insoluble condensation product soluble in alcohol and capable of being hardened is prepared by condensing together a phenol such as phenol, a cresol, cresylic acid, or xylenol, a material containing the characteristic solids of sulphite cellulose waste liquor and an added aldehyde such as formaldehyde or furfural, with or without the addition of acid catalysts such as hydrochloric acid or ammoniacal salts, particularly ammonium chloride. The sulphite cellulose waste liquor may be treated to remove organically combined calcium such as by treatment with sulphuric or oxalic acids or with soluble sulphates or oxalates and filtering off the calcium precipitate. In one example, sulphite waste liquor, phenol, and hexamethylenetetramine are condensed together and the product dissolved in a solvent may be used as a varnish. (See Specification No. 370,752, of Robeson Process Co.)

### Specifications Accepted with Dates of Applications

PRESERVATION OF SOAP, FATS, FATTY OILS, OR DERIVATIVES THEREOF. E. I. Du Pont de Nemours and Co., W. S. Calcott, W. A. Douglass, and H. W. Walker. April 13, 1931. 378,875.

PREPARATION OF TITANIUM COMPOUNDS. P. Spence and Sons, Ltd., and S. F. W. Crundall. April 14, 1931. 378,906.

PREPARATION OF ADDITION PRODUCTS OF ALKALOIDS. Dr. F. W. R. Osten. May 12, 1931. 378,935.

MANUFACTURE OF NITRIC ACID OF HIGH CONCENTRATION. Lonza Elektrizitätswerke und Chemische Fabriken A.-G. May 13, 1930. 378,894.

MANUFACTURE OF CARBYL SULPHATE, ETHIONIC ACID, ISETHIONIC ACID, AND HOMOLOGUES AND ANALOGUES THEREOF. I. G. Farbenindustrie. May 16, 1930. 378,895.

MANUFACTURE, PRODUCTION, AND USE OF CHEMICAL COMPOUNDS WHICH CAN BE USED AS PLASTICISERS. Courtaulds, Ltd., W. H. Glover and W. Berry. May 16, 1931. 378,911.

PRODUCTION OF ALCOHOLS FROM OLEFINES. G. F. Horsley and Imperial Chemical Industries, Ltd. May 16, 1931. 378,865.

PRODUCTION OF CHLORINATED DERIVATIVES OF TOLUENE. T. S. Wheeler and Imperial Chemical Industries, Ltd. May 16, 1931. 378,866.

MANUFACTURE OF WETTING, DETERGENT, FOAMING, AND DISPERSING AGENTS. Imperial Chemical Industries, Ltd., A. W. Baldwin, and A. J. Hailwood. May 16, 1931. 378,867.

PROCESS FOR PROTECTING MAGNESIUM AND ITS ALLOYS AGAINST CORROSION. G. D. Bengough and L. Whitby. May 19, 1931. 378,916.

COLOURATION OF CELLULOSE ESTER OR ETHER MATERIALS. British Celanese, Ltd., G. H. Ellis and J. Allan. May 19, 1931. 378,917.

PRODUCTION OF DIBENZANTHRONE DERIVATIVES. Imperial Chemical Industries, Ltd., I. B. Anderson, P. G. Carter and R. F. Thomson. May 19, 1931. 378,942.

HYDROGENATION CATALYSTS. Dr. E. B. Maxted. May 20, 1931. 378,943.

PROCESS FOR TREATING RUBBER LATEX OR SIMILAR COLLOIDAL SUBSTANCES, *and* APPARATUS THEREFOR. Electrical Research Products, Inc. May 21, 1930. 378,952.

MANUFACTURE AND PRODUCTION OF HYDROGEN FROM HYDROCARBONS. J. Y. Johnson (*I. G. Farbenindustrie*). June 6, 1931. 379,014.

SEPARATION OF ACETIC ANHYDRIDE FROM ADMIXTURE WITH ACETIC ACID AND WATER. A. H. Stevens (*E. Berl*). July 2, 1931. 379,042.

DRYING OF LIQUIDS CONTAINING SOLIDS. C. W. Wilson. Aug. 12, 1931. 379,081.

PREPARATION OF RINSING, CLEANSING, AND FAT-REMOVING AGENTS. Chemische Fabrik Budenheim A.-G. Dec. 1, 1930. 379,152.

LIGHT-SENSITIVE PHOTOGRAPHIC MATERIALS. I. G. Farbenindustrie. Nov. 26, 1930. 379,158.

PROCESS OF EXTRACTING PROTEOLYTIC ENZYME FROM FIG, MULBERRY, PAPAYA, PINEAPPLE, OR BANANA TREES. C. Wada. Jan. 17, 1931. 379,205.

MANUFACTURE OF SHAPED ARTIFICIAL SPONGE MASSES FROM VISCOSE. I. G. Farbenindustrie. Mar. 7, 1931. 379,235.

REMOVAL OF SULPHUR FROM GASES. Dr. C. Otto and Co. Ges. April 15, 1931. 379,247.

PRODUCTION OF CHOLINE COMPOUNDS. F. Körner. April 29, 1931. 379,260.

### Complete Specifications open to Public Inspection

PROCESS AND APPARATUS FOR THE THERMAL DECOMPOSITION OF HYDROCARBONS. Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 18, 1931. 35473/31.

MANUFACTURE OF BITUMINOUS EMULSIONS. P. Lechler. Aug. 17, 1931. 16332/32.

PROCESS FOR REFINING NATURAL ORGANIC PRODUCTS. L. Rosenstein, and W. J. Hund. Aug. 21, 1931. 21636/32.

MANUFACTURE OF CHLOROSULPHONIC ACID. Society of Chemical Industry in Basle. Aug. 17, 1931. 22206/32.

PRODUCTION OF WATER-FREE ALCOHOLIC LIQUID MIXTURES. Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. Aug. 17, 1931. 22808/32.

PRODUCTION OF HIGHER KETONES. British Industrial Solvents, Ltd. Aug. 19, 1931. 22832/32.

MANUFACTURE AND PRODUCTION OF AMMONIUM SALTS OF PHOSPHORIC ACID. I. G. Farbenindustrie. Aug. 18, 1931. 23173/32.

PROCESS FOR THE MANUFACTURE OF COMPOSITE TITANIUM PIGMENTS. I. G. Farbenindustrie. Aug. 19, 1931. 23199/32.

## Applications for Patents

MANUFACTURE OF TITANIUM COMPOUNDS. A. R. Powell and Travancore Minerals Co., Ltd. Aug. 16. 22995.

MANUFACTURE OF COMPLEX COMPOUNDS OF ORGANIC HEAVY METAL MERCAPTO COMPOUNDS. Schering-Kahlbaum Akt.-Ges. Aug. 19. (Germany, Nov. 7, '31.) 23314.

MANUFACTURE OF A PHOSPHORIC ACID ESTER OF GLUCONIC ACID. Schering-Kahlbaum Akt.-Ges. Aug. 19. (Germany, Aug. 20, '31.) 23315.

CONVERSION OF ORGANIC SULPHUR COMPOUNDS. Standard Oil Development Co. Aug. 16. (United States, Sept. 18, '31.) 22960.

WATER SOFTENING APPARATUS. United Water Softeners, Ltd., and R. T. Pemberton. Aug. 19. 23362.

PREPARATION OF CHINA CLAY, ETC. R. J. Varcoe. Aug. 18. 23221.

MANUFACTURE OF AROMATIC OXYCARBOXYLIC ACIDS. Dr. A. Wacker Ges für Electrochemische Industrie Ges. Aug. 18. (Germany, Sept. 9, '31.) 23184.

VINYL RESINS. Carbide and Carbon Chemicals Corporation. Aug. 24. (United States, Sept. 25, '31.) 23662.

DISTILLATION FOR PRODUCTION OF VOLATILE METALS. H. E. Coley. Aug. 26. 23896.

MANUFACTURE OF HYDROXYLATED DIPHENYLS. E. I. Du Pont de Nemours and Co. Aug. 23. (United States, Aug. 24, '31.) 23582.

PRODUCTION OF FORMIC ACID. E. I. Du Pont de Nemours and Co. Aug. 24. (United States, Aug. 24, '31.) 23741.

PREPARATION OF PHENOLS FROM ALKALI ARYLSULPHONATES. G. B. Ellis (*Soc. des Usines Chimiques Rhône-Poulenc*). Aug. 22. 23491.

DEVICES FOR EMULSIFYING, ATOMISING, OR SPRAYING LIQUIDS. G. Harrington. Aug. 26. 23809.

MANUFACTURE OF AROMATIC HYDROXY ALDEHYDES. F. Hoffmann-La Roche and Co., Akt.-Ges. and A. Home-Morton. Aug. 26. 23897.

MANUFACTURE OF ACETIC ACID. J. Y. Johnson (*I. G. Farbenindustrie*). Aug. 22. 23483.

CLEANING AND POLISHING AGENTS FOR METALLIC SURFACES. A. Carpmael (*I. G. Farbenindustrie*). Aug. 23. 23605.

MANUFACTURE OF ACETALDEHYDE FROM ACETYLENE. J. Y. Johnson (*I. G. Farbenindustrie*). Aug. 24. 23708.

PRODUCTION OF SULPHUR FROM GASES CONTAINING SULPHUR DIOXIDE. Imperial Chemical Industries, Ltd. Aug. 24. 23730.

PRODUCTION OF WAX-LIKE BODIES. Imperial Chemical Industries, Ltd. Aug. 25. 23844.

MANUFACTURE OF LAMINATED NON-SPLINTERING GLASS. Imperial Chemical Industrie, Ltd. Aug. 25. 23845.

RECOVERY OF ZINC FROM IRON-ORES. Imperial Chemical Industries, Ltd. Aug. 25. 23846.

MANUFACTURE OF CYANINE DYES. Kodak, Ltd. Aug. 27. (United States, Aug. 27, '31.) 24022.

CONVERSION OF HYDROCARBON OILS. A. L. Mond (*Universal Oil Products Co.*). Aug. 25. 23792.

APPLICATION OF COATINGS TO ARTICLES OF WOOD, ETC. North British Chemical Co., Ltd. Aug. 22. 23428.

APPARATUS FOR SEPARATING SOLIDS, ETC., FROM LIQUIDS. H. E. Partridge. Aug. 26. 23872.

SEPARATION OF SOLID IMPURITIES FROM MOLTEN METALS. Roessler and Hasslacher Chemical Co. Aug. 24. (United States, Aug. 24, '31.) 23087.

DEODORISING SULPHUR COMPOUNDS. A. Skipsey. Aug. 26. 23868.

PRODUCTION OF SULPHUR FROM GASES CONTAINING SULPHUR DIOXIDE. D. Tyrer. Aug. 24. 23730.

RECOVERY OF ZINC FROM IRON-ORES. D. Tyrer. Aug. 25. 23846.

# From Week to Week

WHITE ARSENIC has been added to the free list by the Import Duties (Exemptions) No. 3 Order, issued on August 26.

MR. MEDLEY G. B. WHELPLEY, president of Cosach, has arrived at Iquique to visit the nitrate fields. He is expected at Santiago to-day (Saturday), when he will confer with the Minister of Finance regarding the future of Cosach.

THE RECONSTRUCTION of the chemistry department rooms and the physics laboratory at the United College, St. Andrews, which were destroyed by fire, is now well advanced, and the work should be finished before the University is re-opened.

THE BRITISH ALUMINIUM CO., LTD., Adelaide House, King William Street, London, E.C.4, announces that the telephone number of its new London warehouse at 23-25 Pancras Road, N.W.1, is North 5301 (two lines).

FOLLOWING THE PUBLICITY afforded by the Irish Free State Department of Lands and Fisheries to the health-giving properties of carrageen moss a company, known as the Kargeen Manufacturing Co., has been established in Dublin for the manufacture of products from this weed.

MEMBERS OF THE INSTITUTE OF JOURNALISTS, who held their annual convention at Cardiff last week, took advantage of their visit to the Welsh city to visit the by-product works of the Powell Duffryn Company at Bargoed. Mr. Joseph West, manager of the works, conducted the visitors round, while Mr. Watts, of the research department, explained and demonstrated technical processes.

THE FOURTEENTH ANNUAL EDITION of Fraser's Directory has been received from the publishers at Montreal, Canada. This is the only book in Canada that gives an alphabetical list of all trade names along with the name and address of the maker. It is also the only book that gives a list of all firms represented in Canada, showing the name and address of the Canadian agents, and the only trade directory in Canada that gives street addresses in all cities.

AN APPARATUS FOR THE RECOVERY of beryllium at a considerably reduced cost, permitting a more extensive use of the metal as an alloy, has been developed by the German Beryllium Research Society. The addition of 3 per cent. beryllium to copper alloys or bronze is said to give a tensile strength equal to about 150 kilos per square millimetre. This strength, combined with the flexibility and light weight, especially suits beryllium-bronze alloys for shaft cables of unusual length. These alloys also offer strong resistance to water and air.

MR. R. K. JOPSON, the Commercial Secretary to the British Embassy at Buenos Aires, is now in this country on an official visit. Mr. Jopson will be available at the offices of the Department of Overseas Trade during the period September 19-24 for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to the Argentine Republic. At a later date Mr. Jopson will visit a number of industrial centres in the provinces. Firms desiring interviews with Mr. Jopson in London, or information regarding his arrangements to visit provincial centres, should apply to the Comptroller-General, Department of Overseas Trade, 35 Old Queen's Street, London, S.W.1, quoting the reference 3733 / 32.

FIFTEEN THOUSAND TONS OF WHALE OIL—the whole of next year's production—have been sold to a Manchester company by the Toensberg Hektor Whaling Co. The price is £11 per ton.

MR. CHARLES S. PARSONS, B.Sc., is now released from his partnership engagement with Forrester, Ketley and Co., and will in future be carrying on practice under his own name as a chartered patent agent and consulting engineer, at Thanet House, 231 Strand, W.C.2.

BROTHERTON AND CO., LTD., Leeds, have closed down their chemical works at Bromborough, Cheshire, for an indefinite period. One hundred employees are thus rendered idle, but the firm have decided to pay them part wages *ex gratia*. An over-accumulation of stocks of dyes and colours is reported to be responsible for this step.

FOREIGN GUESTS of the British Association for the York meeting, in respect of the Chemistry Section, include Professor J. Meisenheimer, Chemical Institute, Tübingen; Professor H. Staudinger, University of Freiburg im Breisgau; Professor Max Bergmann, Technical High School, Dresden; Professor H. Kessener, The Hague.

NEW REGULATIONS regarding the limits of variation for fertilisers and feeding stuffs are contained in Statutory Rules and Orders, 1932, No. 658 (H.M. Stationery Office, price 10d. net), dated August 11. Methods of analysis of fertilisers are set out in detail, as well as the exact form of certificate necessary in effecting sales.

A SPECIAL TYPE OF CRIMEAN DANDELION, which, the Moscow Rubber Institute reveal, has a 15 per cent. rubber content, has been found growing along a stretch of 120 miles on the southern coast of the Crimea. Rubber has already been extracted from the weed by laboratory methods. This year about 2,500 acres of the new rubber-bearing dandelion will be planted, and plans for next year call for 125,000 acres of it.

ACCORDING TO THE NEW YORK MARKET, Chilean nitrate is offered for this month and next month at what is believed to be the lowest price on record—$25 a ton. The Cosach Sales Corporation (the selling agency in the United States for Chilean nitrate) announces that the price is to be reduced by $11 a ton for delivery during this and next month, in the hope that by lowering the price business cut by the depression will be stimulated.

RECENT WILLS include: Mr. Walter Hills, of Westbury, Ryde, Isle of Wight, and of John Bell, Hills and Lucas, Ltd., manufacturing chemists, Tower Bridge Road, London, S.E., ex-president of the Pharmaceutical Society of Great Britain, £37,648 (net personalty £37,329); Mr. Thomas Naughton, of Victoria Avenue, Widnes, shipping manager at the Gaskell Deacon and Marsh Works of the Imperial Chemical Industries, Ltd., £1,425 (net personalty £768).

THERE WAS AN INCREASE of over £45,000 in the value of the chemicals, drugs, perfumery, dyes and colours imported into the Irish Free State during the first six months of 1932, and the total value being £655,528, as compared with £610,103 for the corresponding period of last year. The value of chemical fertilisers imported into the country during January to June, 1932, was £335,086.

WENGERS, LTD., of Etruria, Stoke-on-Trent, the well-known ceramic colour, chemical manufacturers, have published a new comprehensive English price list (No. 62) which gives details of a vast variety of the materials they manufacture, and also contains useful information both technical and practical for the ceramic and enamelling industries. This catalogue proves to be one of the most detailed lists ever published. Wengers, Ltd., are an old-established firm, having been founded in 1870, and businesses have been incorporated with same which were in existence as far back as 1820. They have extensive works at Etruria, Stoke-on-Trent, with the most modern machinery and laboratories and grinding plant, and are continually extending their products. They are now manufacturing many goods which were imported previously from the Continent, and their technical service and samples are at the disposal of prospective buyers.

THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, at St. Augustine, Trinidad, was founded as the West Indian Agricultural College in 1921, on the recommendation of a Committee appointed by Viscount Milner, Secretary of State for the Colonies in 1919, to provide instruction in tropical agriculture, and in the cultivation and preparation for market of tropical produce of every kind. According to the current prospectus this college is now the recognised centre for post-graduate training in tropical agriculture for the agricultural services of the Colonial Empire. It is well equipped with laboratories and has about 100 acres of land under cultivation, with the necessary buildings, for field experiments in agriculture. Attached to it also are a sugar factory and a low temperature station both equipped with modern machinery and plant. Particulars regarding the courses offered can be obtained from the Registrar, The Imperial College of Tropical Agriculture, Trinidad, or from the Secretary, 14 Trinity Square, London, E.C.3.

JOINT MEETINGS of the Refractory Materials Section and Building Materials Section of the Ceramic Society will be held in London from September 20 to 22. The meetings of the Refractory Materials Section will be held at the rooms of the Chemical Society, Burlington House, Piccadilly, and the meetings of the Building Materials Section will be held at Olympia. The official banquet will be held on Wednesday, September 21, at Claridge's, Brook Street, W., tickets being 17s. 6d. each (exclusive of wines). On Thursday, September 22, a visit will be paid to the works of the Ford Motor Co., Ltd., Dagenham.

ELDORADO GOLD MINES, LTD., one of the companies now exploiting the pitchblende-silver deposits at Great Bear Lake (Canada), have acquired a factory at Port Hope, Ontario, on which a radium refinery will be established. Equipment is being collected for the installation of the first commercial scale radium extraction plant in Canada. Pitchblende ore from Great Bear Lake will be brought up the Mackenzie River to the railway terminus at Waterways, Alberta. It will then be sent by railway to Port Hope. Chemicals will be obtained chiefly from Sandwich, Ontario. M. Pochon, the radium expert, retained by the Eldorado company as resident chemist, will undertake the application of the process in a commercial chemical plant. The process will be developed on the unit plan, the initial installation at Port Hope being in the nature of a pilot plant.

### Obituary

MR. FRANK COCHRANE, chairman of Henry Cochrane and Son, Ltd., Peel Dyeworks, Newton Heath. Aged 62.

MR. C. RALPH STEVENS, managing director of the Sheppey Chemical Works, Queenborough, Kent. Aged 57.

# Commercial Intelligence

**The following are taken from printed reports, but we cannot be responsible for any errors that may occur.**

## Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

DUSSEK BITUMEN & TAROLEUM, LTD. (late Dussek Bitumen Co., Ltd.), London, S.W. (M., 3/9/32.) Registered August 22, £30,000 debenture (subject to existing morts.), to Branch Nominees, Ltd., 15 Bishopsgate, E.C.; charged on lands at Bromley-by-Bow and Barking, also general charge. *£5,000. June 7, 1932.

MARLEY HILL CHEMICAL CO., LTD., Newcastle-on-Tyne. (M., 3/9/32.) Registered August 18, £14,500 debentures, part of £100,000; general charge. *£8,000. December 31, 1931.

## London Gazette, &c.

### Partnership Dissolved

HAWKINS & ROBERTS (Ernest Mostyn Hawkins and Caryl Cameron Roberts), analytical chemists, Watling Chambers, Watling Street, Canterbury, by mutual consent, August 9, 1932. The business will now be carried on by Ernest Mostyn Hawkins alone.

### Bankruptcy Information

JONES, Charles Frederick, 104 Selborne Road, Southgate, Middlesex, manufacturing chemist. (R.O. 3/9/32.) Receiving Order August 22, 1932, creditor's petition. First meeting, September 5, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2. Public examination November 17, 11 a.m. Bankruptcy Buildings, Carey Street, London, W.C.2.

# Books Received

ALUMINIUMCHLORID IN DER ORGANISCHEN CHEMIE. By Georg Kranzlein. Berlin: Verlag Chemie, G.m.b.H. Pp. 144. M.12.

LABORATORY METHODS OF ORGANIC CHEMISTRY. By L. Gattermann. London: Macmillan and Co., Ltd. Pp. 416. 17s.

ECONOMIC CONDITIONS IN SWITZERLAND. Report by Major H. F. Heywood. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 57. 1s. 6d.

ECONOMIC CONDITIONS IN SYRIA. Report by Sir Harold E. Satow. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 42. 1s. 6d.

ECONOMIC CONDITIONS IN SWEDEN. Report by W. J. Glenny. Department of Overseas Trade. London: H.M. Stationery Office. Pp. 66. 2s.

# New Companies Registered

**Arcon Engineering Company, Ltd.**—Registered August 22. Nominal capital £1,000 in 1,000 founders' shares of 1s. each and 950 ordinary shares of £1 each. To acquire the business of scientific engineers carried on as the Arcon Engineering Company, 26 Flanders Road, Holland Park, W., and to carry on the business of electrical, mechanical and chemical engineers, technical advisers, etc. Directors: A. W. Sharman, 1 Morella Road, Wandsworth Common, London, S.W.; F. O. Read.

**Association of Glue & Gelatine Buyers, Ltd.,** Cransley Works, Garrett Street, Golden Lane, London, E.C.1.—Registered August 18, as a company limited by guarantee, without share capital, with 50 members, each liable for £5 in the event of winding up. The objects are to promote the welfare of glue and gelatine buyers, etc. A subscriber: J. A. Boucher, director of Union Glue and Gelatine Co., Ltd., Cransley Works, Garrett Street, E.C.1.

**Cellulose Compositions Company, Ltd.**—Registered August 24. Nominal capital £5,000 in £1 shares (1,000 7 per cent. cumulative preference and 4,000 ordinary). To acquire the business of industrial application of various chemical processes, more particularly for the manufacture of moulded materials from cellulose and allied substances now carried on by E. F. Whybro and H. P. Bayon at Trumpington, Cambs. Directors: E. F. Whybro, Everdon Villa, Stapleford, Cambs.; Dr. H. P. Bayon, Little Shelford, Cambs.

**Cylinder Lubricants, Ltd.,** 74 Newman Street, Oxford Street, London, W.1.—Registered August 26. Nominal capital £5,000 in £1 shares. To acquire the business carried on at 7 and 9 Wrotham Road, N.W.1, and 74 Newman Street, W.1, as Mixtrol Oil Company, and to carry on the business of oil refiners and manufacturers, chemical manufacturers, etc.

**Oxygen (1932), Ltd.,** Angel Road, Edmonton, London, N.18. Registered August 13. Nominal capital £100 in £1 shares. To carry on the business of manufacturing, compressing and selling oxygen, hydrogen, nitrogen, carbonic acid and any other gases or kindred substances, manufacturing chemists, engineers, etc. Directors: C. H. Beeston, P. B. Liversidge, E. W. Sprott.

**The British-Iberian Minerals, Ltd.,** 17 Mincing Lane, London, E.C.3.—Registered as a "private" company on August 27. Nominal capital £1,000 in £1 shares. The objects are to carry on business as owners and workers of mines containing gypsum, barytes, talc, sulphur, mica and any other minerals or substances, and to acquire any mines, mining rights and land containing any kind of mineral at Garrucha, Carboneras, Aguilas and Almeria in Spain or elsewhere. Directors: E. W. Barnett, J. Hocking, E. E. Barnett, W. R. Hocking.

**The Scottish Gas Light & Coke Co., Ltd.**—Registered as a "private" company on August 24. Nominal capital £100 in £1 shares. To construct, manage or control in Scotland and elsewhere plants, apparatus and machinery for treating coal and other carbonaceous materials for the extraction and recovery therefrom of the gas, oil and other constituents, to carry on the business of a gas works company in all its branches. A subscriber: L. N. Wills, 6 Austin Friars, London, E.C.

**Vivax Ltd.** Registered August 24. Nominal capital £1,000 in £1 shares. Soap makers and perfumers, tallow melters and refiners, glycerine distillers, bone boilers, etc. A director: C. M. Adcock, Grenehurst Park, Capel, Surrey.

## Company News

**Reckitt & Sons.**—A quarterly interim dividend of 5 per cent. is announced, on the ordinary shares, payable on October 1.

**North Broken Hill, Ltd.**—A dividend of 1s. per share has been declared payable in Melbourne on September 30.

**Canada Cement Co., Ltd.**—It is announced that payment of the preference dividend, due on September 30 has been deferred.

**Electrolytic Zinc Co. of Australasia, Ltd.**—A dividend at the rate of 8 per cent. per annum for the six months ended June 30, 1932, has been declared on the preference shares. Payment will be made on October 27 to shareholders registered on September 24.

**United Indigo & Chemical Co., Ltd.**—The annual meeting will be held on September 7, at 11 a.m., at 60 Spring Gardens, Manchester. In their annual report the directors state that after providing for depreciation of plant and machinery, bad debts, directors' remuneration, and all other charges, there remains a profit (including £14,644 brought from last year's account and £1,500 brought from Income Tax Special Reserve) of £21,570. From this sum the dividend already paid on the preference shares for twelve months to June 30, 1932, at the rate of 5 per cent. per annum has to be deducted, leaving a balance of £14,070 which they recommend should be carried to next year's account.

**Drug Inc.**—The results for the first six months of 1932 show that earnings have been well maintained. The gross profit amounted to $30,477,442, compared with $35,780,215 in the corresponding period of 1931. More than half of the decrease is offset by economies in merchandising and operating expenses, which are reduced from $23,602,907 to $20,275,508. The net earnings are equivalent to $2.19 per share, against $3.04 last year. Current assets stand at $58,830,145, but of this, $11,842,359 represents marketable securities at cost; it is stated, however, that provision has been made to bring them to market value as of June 30. Current liabilities amount to $8,350,523.

## Chemical Trade Inquiries

Abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**Canada.**—A manufacturers' agent in Vancouver desires to obtain United Kingdom agencies in drugs, presumably on a commission basis; he covers Western Canada. (Ref. No. 280.)

**Canada.**—A firm of manufacturers' agents at Winnipeg desires to obtain United Kingdom agencies in drug lines on a commission or consignment basis, throughout Western Canada. (Ref. No. 278.)

**Canada.**—A firm of importers, exporters and manufacturers' agents desires to obtain United Kingdom agencies for drug sundries on a commission, purchase, or consignment basis, according to agreement with prospective principals. (Ref. No. 281.)

**Canada.**—The Officer-in-Charge of H.M. Trade Commissioner's Office at Winnipeg reports that he has received an enquiry for the names of United Kingdom manufacturers of water flow indicators. (Ref. G.X. 11779.)

**British India.**—An old-established Madras firm exporting tanned and raw skins, tanned hides, etc., is desirous of obtaining agencies, on commission or consignment, for artificial manures for Southern India. (Ref. No. 273.)

**Egypt.**—The Commercial Secretary to the Residency, Egypt, reports that the Egyptian Ministry of the Interior, Municipalities and Local Commissions Section, is calling for tenders, to be presented in Egypt by October 27, 1932, for the supply, delivery and erection of four Diesel lubricating oil recovery plants of the settling tank and not centrifugal type, to be driven by totally enclosed electric motors. (Ref. A.X. 11476.)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